The Commonwealth of Massachusetts
MASSACHUSETTS SENATE

SENATOR MARK MONTIGNY
Second Bristol and Plymouth District

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Chair
SENATE COMMITTEE ON
POST AUDIT AND OVERSIGHT
Chair
SENATE COMMITTEE ON
INTERGOVERNMENTAL AFFAIRS

March 6, 2026

Dan McKiernan, Director
Massachusetts Division of Marine Fisheries
836 S. Rodeny French Blvd.
New Bedford, MA 02744

RE: Horseshoe Crab Quota Management Proposal

Dear Director McKiernan:

As the State Senator representing the City of New Bedford, I am writing to express my opposition to the proposed reallocation of horseshoe crab from the bait quota to the biomedical sector. After reviewing the proposed regulation, it remains unclear why the department would shift quota toward an industry that can already access additional crab through the so-called rent-a-crab process. In its proposal, the department cites an overabundance of bait with ample stock in frozen storage. However, no data is cited to support this assertion.

While reduction in crab mortality is a laudable goal, the biomedical processes remains a very traumatic experience involving the insertion of a needle into the crustacean's heart to drain its blood. Studies suggest that up to 30 percent of bled crab will later die while others will fail to spawn properly. Keeping an estimated 28,000 additional crab alive annually by shifting the quota does not necessarily equate to a significantly healthier population of horseshoe crab.

Furthermore, these proposed changes will likely inflict a negative impact upon conch fishermen already on the brink of survival. Horseshoe crab remains the primary bait source for these fishermen and Massachusetts remains one of the last fisheries available to them. The potential for economic ruin seems to outweigh the slight improvement in mortality rates for this species.

In closing, I respectfully oppose this proposal and recommend that the quota remain in its current form.

Sincerely,

Mark Montigny
SENATOR

THE GENERAL COURT OF MASSACHUSETTS
STATE HOUSE, BOSTON 02133-1053

March 5, 2026

Dear Esteemed Chair and Members of the Marine Fisheries Advisory Commission (MFAC):

We join the Massachusetts Conch Association in opposing the prohibition or any reduction in the use of Horseshoe Crabs as a bait source in Massachusetts.

There is no viable substitute for horseshoe crab as bait for the conch fishery. Most fishermen mix the horseshoe crab with other food sources as a regular sustainable, management practice. Once that quota is reduced it will never be restored. Several states have imposed either outright bans or severely reduced the harvest of horseshoe crabs. Obtaining horseshoe crabs for bait from other states is not an option. The conch fishermen currently only have one bait supply and that is from our own state waters. The industry opposes any changes in the current horseshoe crab bait fishery. The Horseshoe Crab population in Massachusetts is not only flourishing, but evidence shows that their numbers are increasing mainly because of existing regional, regulatory frameworks that have ensured sustainability.

The commercial bait industry depends heavily on limited, regulated horseshoe crab harvesting to sustain the whelk and eel fisheries; two important sectors of the Massachusetts coastal economy. Prohibiting the use of horseshoe crabs as bait would directly threaten the livelihoods of many local fishermen and small business owners who already face rising costs and declining stocks. In 2023, a similar proposal to restrict harvesting was rejected by a fisheries advisory commission after strong concerns were raised about the potential impact on these working families.

Conservation efforts should focus on balanced, science-based regulation that support both ecological preservation and economic vitality and include measures such as stricter seasonal limits, improved habitat protection, and collaborative research on the adoption of sustainable synthetic testing alternatives rather than outright bans that penalize responsible fishers. Tighter restrictions on bait harvesting risk constraining the overall crab population supply chain, increasing costs, and complicating access for biomedical use.

We urge the Commission to support promoting sustainable management practices, and better stakeholder cooperation versus a straight ban on the horseshoe crab bait source. Thank you for your time and consideration.

Sincerely,



REP. CHRIS HENDRICKS
11th Bristol District



REP. ANTONIO CABRAL
13th Bristol District

From: Colin Urquhart
To: Silva, Jared (FWE)
Subject: Fwd: Horseshoe crab re allocation
Date: Saturday, March 7, 2026 7:02:26 PM

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For some reason the DMF email rejected my submission, here it is again
---------- Forwarded message ---------
From: **Colin Urquhart** <fishrackcharters@gmail.com>
Date: Fri, Mar 6, 2026 at 3:50 PM
Subject: Horseshoe crab re allocation
To: <marine.fish@ma.gov>

Dear Drirector McKiernan,

My name is Colin Urquhart I am a fisherman out of New Bedford, I would like to first say congratulations to the DMF for creating a sustainable horseshoe crab harvest back in 2010 with the lunar calendar closures. HSC populations have been increasing since then.

Despite this great success, year after year, the beach pickers and conch fishermen are forced back here to defend their right to harvest a sustainably managed species. Two years ago 60,000* crabs were reallocated to the biomedical sector, and last year the historically successful lunar calendar closures were replaced with an all out spring closure. The impact on these two changes is yet to be seen but considering prior data already showed increasing populations, further reducing our bait quota feels unjustified.

The DMF has no ability to restrict HSC sales to only Massachusetts fishermen. If the 100,000 crabs is based on the estimated crabs use by Massachusetts fishermen during a low effort year, then theoretically the other 40,000 will be sold out of state or saved for spring conch potting since you've eliminated our ability to harvest bait in the spring. If next year we only get to harvest 100,000 crabs, the number that reaches Massachusetts fishermen will be less than that creating a local shortage assuming efforts remain the same and worse if efforts increase. Effort and consequently landings of conch have been low for a few years following increased gage sizes and a crash in the market caused by recession and trade issues, however there has been an uptick in price this year which will likely entice more effort if the trend continues. That is unless our bait quota is whittled away and we don't have enough HSCs to fish with. How would you feel if there was an increase in effort and there was a shortage of crabs for your Massachusetts fisherman.

As far as the repeated claims that the conch fishery is over fished, that at one point may have been true but it is not true in 2026. Your trawl surveys are not capable of adequately sampling a nocturnal, subterranean species during the day and since "DMF can't justify funding a proper conch pot population survey for a fishery only worth 1.5 million dollars." You have classified them over fished which has been used as ammunition against us.

In your letter to the Marine Fisheries Advisory Commission in November regarding the bills at the state house to outlaw horseshoe crab harvest you said," Banning bait harvest will have significant direct and indirect impacts to the Commonwealth's seafood industry. Although HSCs are not consumed by the public, their harvest and sale as bait are an important component to certain sectors of the commercial fishing economy. The cumulative impacts might be deleterious to the commercial fishing and seafood dealer sector, particularly along Cape Cod and the South Coast where most of the affected fisheries and processing activities occur, and negative impacts food production and seafood availability in the Commonwealth. You and your staff know that the horseshoe crab bait fishery is a key fishery in our state waters that supports not just the fishermen but a whole chain of dealers, processors, all the way to the end consumers. You folks also know with almost certainty that maintaining a 140,000 crab quota will not have adverse impacts on the population. This is 3 years in a row you have made a proposal to chip away our fishery. Reducing our quota based on your estimated HSC consumption from a low effort year with out ensuring the crabs go to Massachusetts fishermen in my opinion is inconsiderate management. Like always, surplus crabs will find a home out of state, and if our effort increases we have the wiggle room at 140,000 crabs to accommodate that. You should be proud that Massachusetts has such a sustainable fishery that we can help neighboring states that fell victim to the Audubon Society war machine. Im sure you are as sick and tired of defending a sustainable harvest as much as I am, and I believe a lot of your motivation for this proposal is to appease the bird people so please stand behind the fishermen, and the data, and don't reallocate any more of our bait quota away. In fact now that I think about it please roll back the spring pick!

Conchs are a species I would like to see my self fish for the rest of my life. After all the hard work yourself and the division has done to protect and bring back the conch fishery, it would be a shame to have it all be for nothing, without an adequate source of horseshoe crab bait there will be no conch fishery.

Thank you for your time
Colin Urquhart
F/V NOMAD

From: Matthew Mayhew
To: Marine Fish (FWE)
Subject: attention of Director Dan McKiernan.
Date: Saturday, March 7, 2026 9:29:44 AM

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This Is a Public Comment on the proposed rule changes for 2026.
1. Regarding the Summer Flounder fishery. I understand the thought process on these changes. I do think this could have a negative effect on price, but like you said in your report this has a lot to do with effort if let's say other fisheries are not targeted as in 2024. IN FAVOR

2.Sea Bass I would just like to say that I don't often catch over #100LB with the net but during squid season on a 1-3day trip this can happen and it would be great to utilize a multi day cumulative trip quota or large tow system where you call in to report a lets say #300 tow instead of just high grading and throwing #200 pounds back.

3.Horse Shoe Crab Bait Quota shift.
The Last few years for the Conch fishery has been an up and a down year fallowed by this past year having a rebound in landings and use of horse shoe crabs. The fishery uses an abundance of crabs in the fall and freezer space becomes limited mid summer. If the bio medical industry needs more crabs lets please keep the horse shoe crab bait quota at 140,000 and just make an increase to the biomedical 240,000. I saw an abundance of horse shoe crab in vineyard sound last summer and released 95% because of a poor bait price and not wanting to kill a cornerstone species for a miserable price. With conch hopes high I foresee a Stock piling of crab happening this year.
- To Increase good reporting data on horse shoe crab/bait skate and more for bait fishery implement automatic Bait dealer permit for certain bait potential permits so that no bait is sold without getting counted. Or just allow to be Entered just on Safis would be best when filing out the months catch reports. Without a bait dealer permit people like myself don't hardly have time for more paperwork so if its just a bait sale item on Safis at least it would be counted.
Question what does Biomedical Pay for Horse shoe Crab ?

Thanks for all of your time on these species,

Matthew Mayhew

From: Celeste Howe
To: Marine Fish (FWE)
Subject: Attention Director McKiernan
Date: Friday, March 6, 2026 9:35:25 PM

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March 6, 2026

Dear Director McKiernan,

My name is Celeste Howe. I am a resident of Barnstable and a friend of fisherman on Cape Cod.

I know fisherman to be great stewards of the sea who care about sustainability of all the species. Without this balance their industry would suffer.

I respectfully urge the Division to consider the cumulative impacts of recent management decisions of the horseshoe crabs and the data demonstrating the effectiveness of existing conservation measures before pursuing further reductions to the bait quota. Any consideration of reallocating quota toward biomedical purposes should account for the full context of the cumulative effects and include the historical role of horseshoe crab bait and it's importance in supporting food fisheries.

Thank you,

Celeste Howe

33 Captain Murphys Way, Barnstable Mass 02630

From: david meservey
To: Marine Fish (FWE)
Subject: Public Comment
Date: Friday, March 6, 2026 4:16:17 PM

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Dear DMF,

Thank you for the informational session on March 3rd and for the opportunity to comment.

From the information provided I learned that 3 separate organizations found a population increase in Massachusetts, 2025 data for the conch fishery has yet to be analyzed, and that Massachusetts is being presented with a substantial amount of additional fluke quota.

Fishers have made significant adjustments and sacrifices to ensure a healthy population of HSC's. Bait bags and smaller baits, lunar closures, reduced quotas and daily possession limits to name a few that contributed to the population increase.

Without the 2025 data being studied it would be impossible to make adjustments to the 2026 conch fishery. This fishery has historically been highly cyclical. As there is currently a downward trend there are upward trends. Without the information current, it would be impossible to see permit transfers, landings, and price. All which seem to have increased. The increasing HSC population helps this small but important fishery. The current bait quota is a reasonable amount to barely sustain the industry during good years.

Like the conch fishery, the fluke fishery is dependent on the current HSC quota. It is no secret, for the mobile gear fleet, a few of everything makes a days pay. It is important the fluke boats are be able to retain crabs as the State is faced with increased quotas.

For these reasons, I oppose proposals to decrease and reallocate the HSC quota. However, if the decision is made to do so, there must be the ability to easily and efficiently reanalyze and make adjustments.

Respectively,

David Meservey

From: Reed, Story (FWE)
To: Silva, Jared (FWE)
Subject: FW: Conched Out - Primary Buyer Status
Date: Friday, March 6, 2026 2:45:42 PM

From: Reed, Story (FWE)
Sent: Friday, March 6, 2026 2:15 PM
To: matthew.maderia@gmail.com
Cc: Lundy, Kimberly (FWE) <kimberly.lundy@mass.gov>
Subject: Conched Out - Primary Buyer Status

Hi Matthew,

I'm following up on our recent phone conversation about the primary buyer status on your Wholesale Truck permit for Conched Out Fisheries LLC, MA Permit # 12704. As we discussed, the permit is not authorized to be a primary buyer (meaning purchase directly from commercial harvesters) of any species in Massachusetts because you do not have a permanent place of business in Massachusetts. I had said I would follow up with Massachusetts' primary buyer rules in writing.

In reference to dealers acting as primary buyers, Massachusetts regulation, 322 CMR 7.07(4)(a) states "**Dealers must have a permanent place of business in Massachusetts. Dealers shall maintain a written record at their Massachusetts place of business of all primary purchases of any species from commercial fishermen in Massachusetts.**" Additionally, the same criteria for primary buyers is described in the annual primary buyer application form.

Currently, your Wholesale Truck permit only allows you to purchase seafood from Massachusetts wholesale dealers and transport it. If you were to establish a permanent place of business in Massachusetts, we would be able to authorize your permit to be a primary buyer.

SAFIS dealer records indicate that you have been buying from Massachusetts boats in 2026. Please note that you are not authorized to do that at this time.

Please let me know if you have any questions.

Story

Story Reed
Deputy Director
Division of Marine Fisheries
Mobile: (617) 418-0603

Email: story.reed@mass.gov
Web: *MarineFisheries*

From: andrew walsh
To: Marine Fish (FWE)
Subject: Public comment horseshoe crab proposal
Date: Friday, March 6, 2026 2:15:38 PM

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Director Daniel McKiernan,

I believe that the horseshoe crab reallocation proposal is far too drastic of a change for the fishing industry at this time. It does not adequately addresses the by-catch needs of the mixed trawl fishery that takes place in the summer in Nantucket sound. By taking 40,000 crabs from the "bait fishery"(common pool that all permitted vessels can utilize) and shifting more quota to the directed biomedical fishery (private fishing quotas issued to only two entities) this proposal will almost certainly exasperate a situation where more targeted effort will be directed at horseshoe crabs by fewer boats. Meanwhile the rest of the fleet will have less crabs leading to regulatory discards while attempting to pursue other species. It could also lead to a shortage of bait in future years that the conch pot fishery heavily relies on. The fishery needs the 140,000 crabs currently allocated to allow for by-catch needs and anything less will negatively impact the intended conservation efforts that this proposal is attempting to achieve. Any transfer whether now or in the future needs to be set aside for by-catch purposes and not a directed fishery. For these reasons I am asking that you maintain status quo at this time.

I am asking that DMF hold a series of meetings to take a holistic view of the mixed trawl fishery and look at how the fishery as a whole operates currently as well as historically. I believe it is important that both the fishing and bio medical industries participate so that we can address the needs of both industries. We need to look at how all species are managed together and how the fleet has been spread out geographically in the past. For example changing conch regulations over the last 10-12 years have had a huge effect on how the fleet is distributed throughout the sound. These regulations have changed the distribution of the fleet so dramatically that they are significantly effecting horseshoe crab management, at the same time they have effectively ended the trawl fishery for conch. If DMF were willing to look at the mixed trawl fishery with an ecosystem based management approach as opposed to individually managing each species many conflicts could be easily resolved.

If dmf insists on moving forward with a quota transfer without addressing the underlying issues that the fishing industry is facing. I ask that safe guards be put in place as well as a sunset clause so that these issues can be properly addressed in the future. One safe guard that would help encourage utilization of by-catch would be to set equal trip limits for both bait and biomedical crabs and hold off on increasing the limits until September 1st or the day after the fluke fishery closes which ever occurs first. This would encourage more bait crabs to be bled through the rent a crab program as well as a higher number of boats to partner up with the biomedical industry during the height of the season. Thank you for taking the time to read my comment. I look forward to collaborating with DMF in the future.

Thank you
Andrew Walsh

From: Tom Luce
To: Marine Fish (FWE)
Subject: Horseshoe Crab 2026 Draft Proposal
Date: Friday, March 6, 2026 9:13:30 AM

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ATTN: Dan McKiernan
Hello Dan, wanted to add a few things at the zoom public hearing but struggled with connecting the mic on iPhone. The Horseshoe crab presentation and the researched Data is detailed and looking very positive for the future and for the Industry. A few bullet points from my perspective to summarize.
* The Horseshoe crabs in Massachusetts are Not migratory, they do Not migrate out of MA state waters. Therefore, DMF is in total control of its management.

* The Horseshoe crab population in Massachusetts waters is healthy and is in good position to thrive. Enhanced recruitment will occur with the recent Spring spawning closure.

* Monitoring the Conch Pot Fishery usage of horseshoe crabs and making in-season adjustments if necessary during the season-a percentage baseline needs to be adopted for the bait and bio markets, to protect its quota shares.

* Dedicated research from DMF in determining the status of Massachusetts Horseshoe crabs is ranked 2nd only behind American lobsters of all the MA quota-managed species.

*Massachusetts Horseshoe crabs have been monitored and quota-managed since 1998. And the science, research, and monitoring/management continues to advance.
*The Red Knot bird is a late-summer/Autumn migratory species in Massachusetts. Therefore, is not a factor during the Massachusetts Horseshoe crab Spring spawning season. In fact, the Red Knot bird flys Northwest towards Hudson Bay and the Arctic when departing Delaware Bay(their Spring primary stop over location).

*The Massachusetts Division of Marine Fisheries are going above and beyond in their roles managing the status of Massachusetts Horseshoe crabs. Typically, in my 40 plus years as a commercial fisherman (past 23 years as a conch pot fisherman)-when a quota-managed species stock is increasing and healthy, the opportunities for commercial fisherman will increase. And when the resource is doing poorly, commercial fishing opportunities will decrease. Hence, the need to adopt conservation measures. The Black Sea Bass a good example. I can recall 2 or 3 consecutive seasons where the annual commercial harvest quota was 300,000 lbs or less. Now, the upcoming 2026 quota is well over 1 million lbs. Horseshoes crabs are a healthy resource in the State of Massachusetts, opportunities for commercial fishermen should be increasing or at the very least remain status quota. The constant outside pressure from Conservation groups whom only will be satisfied with a net-zero harvest level of horseshoe crabs is insulting to the Fishing Industry, the established Science and the Management efforts provided from the Division of Marine Fisheries.
Thank you,
Tom Luce
508-274-9402

Sent from my iPad

From: Jacob Angelo
To: Marine Fish (FWE)
Subject: Opposition to hsc quota reallocation
Date: Friday, March 6, 2026 8:48:23 AM

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Horseshoe Crab Letter

Dear Drirector McKiernan,

My name is Jake Angelo and I am a commercial fisherman and wholesaler in the town of Barnstable. I would like to first say congratulations to the DMF for creating a sustainable horseshoe crab harvest back in 2010 with the lunar calendar closures. HSC populations have been increasing since then.

Despite this great success, year after year, the beach pickers and conch fishermen are forced back here to defend their right to harvest a sustainably managed species. Two years ago 60,000* crabs were reallocated to the biomedical sector, and last year the historically successful lunar calendar closures were replaced with an all out spring closure. The impact on these two changes is yet to be seen but considering prior data already showed increasing populations, further reducing our bait quota feels unjustified.

The DMF has no ability to restrict HSC sales to only Massachusetts fishermen. If the 100,000 crabs is based on the estimated crabs use by Massachusetts fishermen during a low effort year, then theoretically the other 40,000 will be sold out of state or saved for spring conch potting since you've eliminated our ability to harvest bait in the spring. If next year we only get to harvest 100,000 crabs, the number that reaches Massachusetts fishermen will be less than that creating a local shortage assuming efforts remain the same and worse if efforts increase. Effort and consequently landings of conch have been low for a few years following increased gage sizes and a crash in the market caused by recession and trade issues, however there has been an uptick in price this year which will likely entice more effort if the trend continues. That is unless our bait quota is whittled away and we don't have enough HSCs to fish with. How would you feel if there was an increase in effort and there was a shortage of crabs for your Massachusetts fishermen?

The vast majority that supports this proposal are extremely misinformed people who believe the horseshoe population is in jeopardy. The Mass Audubon Society posted a solicitation to submit a pre written public comment to their 61,000 Facebook followers with a few clicks of the mouse and this is how it starts. "Horseshoe crabs are iconic and valuable members of a biodiverse ecosystem. However, in Massachusetts, they're harvested for bait despite populations struggling to keep up." Mean while yesterday I saw the DMF's Facebook with 1/4 the followers post, "Good News, HSC Populations are increasing in Massachusetts!" Considering the Audubon's point and click public comments were enticed through blatant misinformation you should disregard those submissions.

I did some research on the Red Knot, the pinnacle of the Audubon's debate, and found that it

mainly feeds on HSC eggs in Delaware Bay not Massachusetts. In fact on the Mass Audubon website in the “find a bird” feature it reads,” The Red Knot is a very *uncommon spring* and locally abundant fall migrant in Massachusetts that has been proposed for listing as a federally Endangered species. The eastern North American population of this shorebird has shown a precipitous decline in recent years, attributable, in part, to the overfishing of horseshoe crabs, whose eggs constitute an essential portion of the Red Knot's diet during their *spring migratory stopover in Delaware Bay*.”

HSC populations have be increasing with leaps and bounds while Red Knots have not and the fact that Reds Knots are rarely seen in Massachusetts during the HSC spawn further shows the extent the Audubon will go to misinform the public and manipulate supporters.

On the National Audubon’s website bird guide under Red Knots diet reads,” Includes mollusks, insects, green vegetation, seeds. In migration and winter, feeds on small invertebrates that live in mud of intertidal zone, *especially* small mollusks, also marine worms, crustaceans. On breeding grounds, feeds mostly on insects, especially flies. Also eats much plant material, especially early in breeding season (when insects may be scarce), including shoots, buds, leaves, and seeds.” I find it strange there is no mention of HSC eggs, and considering its migratory range and range in diet, I find it hard to believe harvesting from increasing horseshoe crab populations are the reason for their decline.

NOAA has denied the petition to include horseshoe crabs to the endangered species list saying that,” We find that the claims presented by the petitions do not comprise substantial scientific or commercial information indicating inadequacies of existing regulatory mechanisms such that a reasonable person conducting an impartial scientific review would conclude that listing may be warranted.” These Audubon people are certainly not reasonable.

If I had a dollar for every, “I saw more HSC when I was a kid,” id be a rich man. The reality is that these individuals are experiencing the Mandela effect. They are all folks in their retirement who likely don’t get out on the water as much as when they were kids because if they did they would see the same horseshoe crabs everywhere that the scientists and fishermen are observing. I’m 34 years old and been on the water my entire life, and I actually see wayyy more horseshoe crabs now than when I was a kid. Just look at all the shed pictures DMF posted online this past fall.

As far as the repeated claims that the conch fishery is over fished, that at one point may have been true but it is not true in 2026. Your trawl surveys are not capable of adequately sampling a nocturnal, subterranean species during the day and since “DMF can’t justify funding a proper conch pot population survey for a fishery only worth 1.5 million dollars.” You have classified them over fished which has been used as ammunition against us.

In your letter to the Marine Fisheries Advisory Commission in November regarding the bills at the state house to outlaw horseshoe crab harvest you said,” Banning bait harvest will have significant direct and indirect impacts to the Commonwealth’s seafood industry. Although HSCs are not consumed by the public, their harvest and sale as bait are an important component to certain sectors of the commercial fishing economy. The cumulative impacts might be deleterious to the commercial fishing and seafood dealer sector, particularly along Cape Cod and the South Coast where most of the affected fisheries and processing activities occur, and negative impacts food production and seafood availability in the Commonwealth.

You and your staff know that the horseshoe crab bait fishery is a key fishery in our state waters that supports not just the fishermen but a whole chain of dealers, processors, all the way to the end consumers. You folks also know with almost certainty that maintaining a 140,000 crab quota will not have adverse impacts on the population. This is 3 years in a row you have made a proposal to chip away our fishery. Reducing our quota based on your estimated HSC consumption from a low effort year with out ensuring the crabs go to Massachusetts fishermen in my opinion is inconsiderate management. Like always, surplus crabs will find a home out of state, and if our effort increases we have the wiggle room at 140,000 crabs to accommodate that. You should be proud that Massachusetts has such a sustainable fishery that we can help neighboring states that fell victim to the Audubon Society war machine. Im sure you are as sick and tired of defending a sustainable harvest as much as I am, and I believe a lot of your motivation for this proposal is to appease the bird people so please stand behind the fishermen, and the data, and don't reallocate any more of our bait quota away. In fact now that I think about it please roll back the spring pick!

Thank you for your consideration,
-Jacob Angelo
Cape Cod Artisanal Fishers
Barnstable Seafood Company

- Jacob Angelo
Cell: 508-367-7830
Barnstable Seafood: 774-994-1711

From: Phillip Michaud
To: Marine Fish (FWE)
Subject: Biomedical horseshoe crab possession limit
Date: Thursday, March 5, 2026 2:32:57 PM

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In response to possible possession limit reduction of the biomedical crab fishery.
I would like to share my thoughts and experiences

We have achieved zero mortality in the biomedical crab harvest aboard our vessel.
This success could not have been achieved if this was not a directed fishery for biomedical horseshoe crabs.

We've taken many steps to modify our fishing style to accomplish zero mortality verse Summer flounder techniques
We have modified our sweeps and cod ends, bottom tow time duration. Avoiding Shell gravel bottom which would lead to bleeding crabs or mortality.
We have two large horseshoe crab holding tanks 1000 gallons each, with high volume water flow for stabilizing the crabs

I believe reducing the biomedical possession limit would result in a summer flounder directed fishery with a by-catch of biomedical crabs
I don't know if the same caution will be given to the well-being of the horseshoe crabs, as the main focus will be on higher Summer Flounder, catch rates.

The laboratories require a steady supply of crabs, without a biomedical directed fishery the relationship dynamic will change,
there will be instability when there are a greater opportunities perhaps in the squid fishery, Whiting fishery, scallop fishery, etc.
vessels will come and go. We have seen this over the years.

Thank you for your time

Phillip Michaud jr

From: Jason and Cheri Amaru
To: Marine Fish (FWE)
Subject: HSC comments, Attn: Dan McKiernan
Date: Wednesday, March 4, 2026 4:45:29 PM

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As a participant in the Horseshoe crab fishery in the state waters of Massachusetts, mainly in the Nantucket Sound area, I support the DMF proposal for the upcoming 2026 season.

We work consistently to ensure best handling practices are followed and refined if needed, with the ultimate goal being the lowest achievable mortality rate.

Additionally, we have taken both DMF scientists and observers whenever asked throughout the season, and have consistently demonstrated to both how low that rate is.

The Biomedical hsc fishery is one of the most sustainable i have participated in during my career, which is now spanning 30 years and many different mobile gear fisheries.

The health of the resource is excellent and is verified by science that includes both beach surveys as well as Massachusetts Division of Marine Fisheries trawl surveys.

-Jason Amaru
FV Joanne A III
Chatham

From: tappys.trinkets@everyactioncustom.com on behalf of Joe Schmo
To: Marine Fish (FWE)
Subject: proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:56:22 PM

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Dear Massachusetts Division of Marine Fisheries,

These form letters are an embarassing pile of deliberate misinformation and in many cases lies.
The poor souls who sign them are victims of a deliberate attempt to mis-inform the general public, and put word in the mouths of people who dont know better.

They contain incorrect information and should be discarded or used to line a bird cage, or cat litter box. They have no value or use in intellegent discussion or debate.
They should all be treated like the garbage they are.
The hardworking people of Massachusetts deserve better than this.

From: Winsor Watson
To: Marine Fish (FWE)
Subject: For Dan McKiernan
Date: Tuesday, March 3, 2026 8:37:07 AM

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Dan

Just saw your Facebook post about the meeting coming up tomorrow.
Ironically, I will be busy meeting with some colleagues to talk about a Horseshoe crab paper we are writing, based on volunteer surveys of horseshoe crab spawning in the Great Bay Estuary, NH.

Hopefully you are aware of some of my work with horseshoe crabs and bleeding, etc. If not, I can send you publications.

Bottom line:

If you treat them right, mortality can be lower than 20-30%.
For example, you can feed them before or after bleeding them. This is a big help.
Those females that do survive being bled will take about 2-4 weeks to recover and will only spawn half as much as normal females.

Most importantly, don't focus on the larger females and do not harvest them during their spawning season in May and June.

Best

Win Watson
Emeritus Professor
UNH

From: John Moran
To: Marine Fish (FWE)
Subject: Proposed Reduction in the Horsehoe Crab Bait Fishery
Date: Friday, February 27, 2026 12:33:00 PM

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Good Afternoon, I am writing to weigh in on the proposed reduction for the Horseshoe crab bait fishery in Massachusetts on behalf of the Massachusetts Conch Association. The Association is against any reduction in the current horseshoe crab bait fishery. A couple of years ago there were new rules enacted that basically stopped the beach harvesting of horseshoe crabs. This measure has helped increase the population of horseshoe crabs in the state. There is much science to back up this fact. Horseshoe crab is a necessary bait for conch fishermen. There is no substitute for this crab for bait. Currently most conch fishermen mix horseshoe crab in with other items to conserve on the use of the crab. Many states have either outright banned or severely reduced the harvest of horseshoe crabs. Many of the other states do not have enough supply for their own fishermen. Once the bait fishery is reduced it will never be increased again and this along with the reasons above are why the association is against any reduction in quota for the horseshoe crab bait fishery. Massachusetts needs to preserve and protect the bait supply from state waters for our own fishermen. If the state of Massachusetts will not support their own fishermen and vital shoreside businesses who will?

John Moran Jr.
Massachusetts Conch Association

CAPE COD COMMERCIAL
FISHERMEN'S
ALLIANCE
Small Boats. Big Ideas.

February 26, 2026

Director Dan McKiernan
MA Division of Marine Fisheries

Re: Proposed amendments to Division of Marine Fisheries regulations

Dear Director McKiernan,

On behalf of the Cape Cod Commercial Fishermen's Alliance, I write in opposition to the proposed reduction in the Horseshoe crab bait quota from 140,000 crabs to 100,000 crabs and the reallocation of these 40,000 crabs to the biomedical sector.

Our organization represents small-boat, community-based fishermen across Cape Cod who depend on responsibly managed local fisheries and access to sustainable bait sources. Our members are deeply committed to sustainable fishing practices, local stewardship, and science-based management of the Commonwealth's marine resources. The limited, highly regulated harvest of horseshoe crabs for bait in Massachusetts is a model for sustainable management that balances ecological protection with the economic realities of coastal communities.

The MA Division of Marine Fisheries already maintains comprehensive protections for horseshoe crabs that far exceed management measures in most neighboring states. Commercial harvesters must comply with:

- **Complete harvest closures during spawning periods** tied to the lunar cycle, ensuring crabs are protected during peak reproductive periods (April 15-June 7) in all Massachusetts waters;
- **Prohibition of harvest of horseshoe crabs** within the boundaries of the Cape Cod National Seashore and the Monomoy National Wildlife Refuge
- **Prohibition within the waters of Pleasant Bay** for bait fishery, implemented in 2006 and adopted permanently in 2007.
- **Strict permitting, reporting, and trip limits** (300 horseshoe crabs per trip limit for participants in the limited access bait fishery),enforced by the Division of Marine Fisheries (DMF) ensuring DMF has real-time monitoring of harvest activity

Starting in 2024, spawning horseshoe crabs received the added protection of a continuous 7 ½ week no-harvest closure from mid-April through June 7. This new rule replaced the state's 5-day "lunar closures" that surrounded each new and full moon in the spring which began in 2010. This new protection enhanced conservation by maximizing the spawning potential of the local populations. Based on data collected from MA Division of Marine Fisheries that described the timing of spawning activity, this closure time period will protect about 90% of spawning crabs, allowing them to deposit eggs on Massachusetts beaches undisturbed.

In Massachusetts, horseshoe crab populations appear to be increasing in recent years (MA DMF). The most recent stock assessments for Horseshoe crabs (2019 and 2024) showed abundance in Massachusetts has

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been increasing since horseshoe crab management started in 1998, citing data from MA DMF's semi-annual trawl surveys. The MA Division of Marine Fisheries recently shared via social media that 2025 was a great year for horseshoe crabs in Massachusetts. They state: "Last year, we saw record numbers of female crabs in the spring trawl survey south of Cape Cod, the seine survey had its 3rd best year (behind 1988 and 2023), and 90% of the spawning beach surveys are showing increasing trends over the last ten years. In fact, over the past 10 to 15 years, we have seen positive trends in abundance across all three surveys."

Despite the increase in horseshoe crab populations, MA DMF has continued to manage this species conservatively with precautionary management and rigorous oversight. The bait fishery is subject to an annual quota. The quota was first set by Addendum I to the ASMFC Fishery Management Plan (2000) at 339,337 horseshoe crabs annually. In 2008, the MA Division of Marine Fisheries with the approval of the Marine Fisheries Advisory Commission instituted new regulations for the harvest of bait crabs, including reduction in annual quota from 330,337 to 165,000, and a reduction in daily limit from 1,000 to 400 crabs. In 2023, the Marine Fisheries Advisory Commission (MFAC) voted unanimously in favor of adopting additional conservative measures by MA Division of Marine Fisheries that cut the states quota for the bait fishery from 165,000 to 140,000 making it far below the state's 330,377 crab allowance in the Atlantic States Marine Fisheries Commission's interstate management plan (ASMFC 2024). These science-based measures are conservative and ensure that the Commonwealth's horseshoe crab population remains healthy while allowing a small number of horseshoe crab harvesters to continue a traditional bait harvest critical to local conch fisheries.

Currently there are 32 active horseshoe crab bait endorsement holders across Massachusetts (13 using hand gear, and 19 using mobile gear (Data sources: MATL Reports, NMFS VTRs). From 2022 to 2024, the top ten Massachusetts fishing ports with horseshoe crab bait landings, in order, were Chatham, Hyannis, Orleans, Harwich Port, Eastham, Woods Hole, Barnstable, Mashpee, Wellfleet, and Plymouth (Sources: MA Commercial Catch Reports, NMFS VTRs). The revenues from horseshoe crab landings contribute substantially to the profitability of these commercial fishing businesses, and for some mobile gear fishermen, it represents the second most valuable species retained. In 2024, dealers reported the bait fishery took 139,970 horseshoe crabs, about 99% of the annual 140,000 crab quota. Bait fishermen are required to sell their catch to authorized dealers, and the bait dealers re-sell these horseshoe crabs to supply the state's conch pot fishermen. Additionally, some horseshoe crabs are exported to other states where there is a demand for this bait. With this proposal, to reallocate 40,000 crabs to the biomedical sector, there are equity concerns in terms of a reduction to the bait sector, but also in terms of bait quota not remaining in Massachusetts if exported to other states, therefore limiting the supply available to conch fishermen here locally.

The limited horseshoe crab bait fishery is an important part of Cape's small-boat commercial fleet, supporting local conch and whelk fishermen who rely on horseshoe crab bait to maintain their livelihoods. In 2024, there were 127 conch pot endorsement permits issued, and 45 actively fished (MA Commercial Catch Reports and NMFS VTRS). The whelk fishery supports active commercial harvesters, many based in Cape Cod's small ports. The highest ports with conch landings were Martha's Vineyard (35.8%), Harwich Port (12.0%), and Chatham (11.9%). Horseshoe crabs are the primary bait for the conch pot fishery. Reduction to the bait harvest quota, also impacts the state's conch pot fishery because they would see a reduction in access to their primary bait source. Losing access to local horseshoe crabs will decrease the profitability of this fishery and force fishermen to use less productive bait at a time when this fishery is already dealing with economic factors impacting domestic and international market demand.

Reallocation horseshoe crab quota to the biomedical field would unnecessarily penalize compliant harvesters who follow the rules and operate under strict state regulations to ensure the sustainability of the resource. It would also increase dependence on imported or synthetic bait, raising costs for local fishermen and shifting ecological pressure to other regions where management standards may not be as robust. Trials testing effectiveness of alternative baits to horseshoe crab for whelk fisheries have been previously conducted and harvesters reported poor results (2017 Horseshoe Crab Technical Committee Report).

We urge you to maintain the quotas, which already provides strong conservation measures and protection, rather than reducing this well-managed local bait fishery. A reallocation of horseshoe crab quota to the

biomedical sector would have significant economic consequences for these fishermen and their communities while doing little to improve conservation outcomes beyond what existing protections already achieved through MA Division of Marine Fisheries. The best available science, supported by state and federal horseshoe crab biologists, demonstrates that horseshoe crab populations in Massachusetts are increasing in abundance. This is a direct result of MA DMF and ASMFC managing the species conservatively and with rigorous oversight.

Thank you for your attention to this issue and for your ongoing support of policies that sustain both our marine resources and the fishing communities that depend on them.

Sincerely,

Aubrey Church

Aubrey Church
Fisheries Policy Director
Cape Cod Commercial Fishermen's Alliance

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ECKLAND & BLANDO

Samuel P. Blatchley*
Mobile:401-330-7417
sblatchley@ecklandblando.com
*Admitted to Practice in MA, ME, NY, & RI

March 6, 2026

VIA E-MAIL ONLY
Marine Fisheries Advisory Commission
Massachusetts Division of Marine Fisheries
251 Causeway Street, Suite 400
Boston, MA 02114
marine.fish@mass.gov

Re: Public Comment on Proposed Horseshoe Crab Quota Reallocation

Dear Members of the Marine Fisheries Advisory Commission:

On behalf of the Massachusetts Conch Association, I write to provide comments regarding the Division of Marine Fisheries' proposal to reduce the bait horseshoe crab quota from 140,000 crabs to 100,000 crabs and reallocate the remaining quota to the biomedical sector.

The Massachusetts conch (whelk) fishery is a vital component of the Commonwealth's maritime economy. It is composed primarily of small, family-run businesses that supply sustainable, locally harvested seafood to domestic and international markets. Approximately 150 Massachusetts permit holders depend on reliable access to horseshoe crab bait to maintain their operations. The commercial bait industry also supports the eel fishery, another important sector of the Commonwealth's coastal economy.

While we appreciate the Division's efforts to align quota management with evolving market conditions, the proposed reallocation raises significant concerns for fishermen whose livelihoods depend on this resource.

1. The Proposal Does Not Adequately Reflect the Needs of the Conch Fishery

The Division's proposal assumes that bait demand for the conch fishery will remain between approximately 75,000 and 90,000 crabs annually. While historical data may suggest reduced effort in recent years, quota decisions should not lock the fishery into a reduced baseline that may reflect temporary market conditions rather than long-term demand.

The conch fishery has historically experienced fluctuations tied to export markets, regulatory adjustments, and environmental conditions. Should market demand improve or effort rebound, a reduced bait quota could unnecessarily constrain fishermen and undermine the fishery's ability to recover. Maintaining sufficient quota flexibility is essential to allow the fishery to respond to changing economic conditions.

Equally important, there is currently no viable substitute for horseshoe crab bait in the conch fishery. Fishermen often combine horseshoe crab with other bait sources as part of regular

and sustainable fishing practices, but the horseshoe crab remains the essential component that makes the fishery economically viable.

2. Disproportionate Allocation to the Biomedical Sector Raises Equity Concerns

The proposed reallocation would significantly increase the biomedical quota while reducing the quota available for bait harvest. This shift effectively prioritizes the needs of a relatively small number of biomedical processors over the broader community of commercial fishermen who rely on horseshoe crabs as bait.

Although biomedical harvest is described as catch-and-release, available research suggests mortality rates of approximately 15–30 percent following the bleeding process, along with potential sublethal effects on reproduction and long-term survival. As a result, increasing biomedical access to horseshoe crabs does not necessarily produce the conservation benefits often assumed.

By contrast, the bait fishery operates under strict trip limits, quotas, and reporting requirements. Fishermen utilize the resource efficiently to support a domestic seafood industry that provides economic benefits across Massachusetts coastal communities.

3. Massachusetts Fishermen Have Limited Alternative Supply Options

Massachusetts fishermen rely almost entirely on horseshoe crabs harvested from state waters. Other states have imposed outright bans or severe harvest reductions, making it difficult or impossible to obtain horseshoe crabs from outside Massachusetts. As a result, reducing the Commonwealth's bait quota could effectively leave fishermen without any reliable alternative source of bait.

Once bait quotas are reduced, they are rarely restored. For many fishermen, this proposal therefore raises concern that a temporary shift in management could become a permanent constraint on the fishery.

4. The Proposal May Further Concentrate Access to the Fishery

Over the past decade, management changes have increasingly shifted participation in the horseshoe crab fishery toward larger mobile gear operations and entities with direct relationships to biomedical processors. Expanding the biomedical quota risks further concentrating access to the resource among a smaller number of participants while limiting opportunities for traditional bait harvesters.

Maintaining balanced access to horseshoe crab harvest is critical to ensuring that the economic benefits of this resource remain distributed throughout the Commonwealth's waterfront communities.

5. Adaptive Management Remains the Appropriate Framework

Massachusetts has long been a leader in science-based fisheries management. The Division of Marine Fisheries already possesses the regulatory tools necessary to manage horseshoe crab harvest through adaptive quota adjustments, trip limits, and seasonal controls.

Rather than implementing a significant structural shift in quota allocation, the Commission should consider whether other alternatives would better balance conservation goals with the needs of commercial fishermen.

Conclusion

The Massachusetts Conch Association supports responsible stewardship of the Commonwealth's marine resources and recognizes the importance of maintaining healthy horseshoe crab populations. However, the proposed quota reallocation risks undermining a long-standing commercial fishery that supports numerous small businesses and coastal communities.

For these reasons, we respectfully urge the Marine Fisheries Advisory Commission to reconsider the proposed quota reallocation or, at minimum, ensure that any changes preserve sufficient bait availability to support the continued viability of the Massachusetts conch fishery.

We appreciate the opportunity to provide these comments and look forward to continued collaboration with the Division and the Commission on responsible, science-based fisheries management.

Very Truly Yours,



Samuel P. Blatchley

From: Tom Luce
To: Marine Fish (FWE)
Subject: 2026 Public Comment for State fisheries
Date: Wednesday, February 25, 2026 3:38:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

ATTN: Dan McKiernan.
Suggestions:
Sea Bass regulatory changes:
Perhaps propose 6 days per week opening, beginning July 1. Instead of a 5-day. This will enable capitalizing on higher prices for Jumbo and Large sea bass as they are more prevalent earlier in the season. The previous few years, by September, Jumbo and Large sea bass begin migrating out of range, eventually leaving only medium sea bass left to harvest. And they are not worth much .75 cents-1.00$ per pound.
Also, a concerted effort to promote and market Black Sea Bass is desperately needed. Very rarely do you see Black Sea bass on local menus or fish markets. Frustratingly, the fishery is still heavily dependent on the Asian market.

Horseshoe Crab:
The most important issue is to protect horseshoe crab harvesting in the State of Massachusetts. Bill H.898 in the MA State Legislature wants to permanently ban Bait harvesting levels to zero. But not the biomedical? No horseshoe crabs-no Conch Pot Fishery. Using alternative baits would result in a minimum 50% catch rate loss, essentially eliminating any profit. And wiping out the fishery. The Horseshoe Crab assessment/recruitment in MA waters is healthy and has been quota managed since 1998. The Red Knot bird migration pattern does not coincide with the Massachusetts horseshoe crab spawning timeframe. And in fact, research shows they migrate Northwest from their Delaware Bay stop over area towards St. John's/Hudson Bay. Therefore, not a factor in MA waters-a main issue the environmental/conservation organizations always focus on. There is no justification to end the bait harvest, this bill should be easily voted down in favor of the fishermen.

In 2025, percentages for Bio/Bait harvesting was 60%-40% respectively. Changing the crab allotments for 2026 doesn't change the percentages. The poundage is only borrowed due to the current assessment of bait usage. It's hard to believe the Biomedical Industry willingly sacrificing their quota in the future for the bait market. Hence, the need to solidify quota percentages going forward.
The conch gauge increases is definitely the main reason for reduced effort, directly leading to less bait usage. But this can change in the near future-replenished conch due to the gauge size conservation measures. And especially if market conditions stabilize and improve.
Also, marketing and awareness for Channeled Whelk is a must. Another fishery unknown outside of niche ethnic markets. The Florida keys and South Florida is well known for having several conch dishes. Local Jamaicans and Caribbeans on Cape Cod adamantly praise our Conch as better than the Queen Conch. And yet, again, the Massachusetts Conch pot fishery is mainly dependent on the Asian markets.
Thanks for reading Dan.
Tom Luce
508-274-9402
Sent from my iPhone

From: Tyler Hagenstein
To: Marine Fish (FWE)
Subject: Attention director Mckiernan
Date: Wednesday, February 25, 2026 1:02:02 PM

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Dear DMF,

I am writing to you in regards to the pending horseshoe crab harvest restrictions. After years of keeping a close eye on the horseshoe crab populations and the legislation around it, I would like to thank you for bringing their population back and protecting them. In the last decade they have been classified by the state as stable and improving. This has been done by your team of researchers and the regulations you have enforced. Congratulations on this achievement.

The Audubon society is pushing a different story. They are showing pictures of molted crabs saying they're being wiped out. They are begging the public to stop the bait fishery and demonizing our working waterfront and fishermen. They have been pushing a false narrative that horse shoe crabs are being depleted by the few fishermen who target them. It is not right or fair to fishermen and the people who depend on this fishery directly or indirectly for this non profit to continue to push this narrative. Clearly they are well established and have a larger support network than any group of fishermen. DMF went against the science when Audubon made a push to get ride of the "spring pick". This hurt small boat fisherman. As someone who make their living on the water, this also put a lot of uncertainty in my career. I do not have a horseshoe crab permit or a conch permit but it left me wondering, will groups like these always get their way when demonizing fisherman?

Moving 40,000 crabs from the bait fishery to the biomedical industry will once again hurt small boat fisheries and benefit draggers, they same way it did when the spring pick was eliminated.
DMF went against the science when getting rid of the spring pick, so this time around I ask that your team stays true to its own research to not only protect the small quota that is left, but also consider bringing back the spring pick.

Thank you,
Tyler Hagenstein
Channel Rock Oyster Company

Department of Marine Fisheries
marine.fish@mass.gov

Re: Opposing to the reduction of Horseshoe crab bait proposal

Good Morning:

My name is Henry Borges. I have been conching for over 25 years. I strongly oppose the reduction in the horseshoe crab bait proposal. As your department has reported there is an increase in the horseshoe crab numbers. Until scientific data shows a reduction in the horseshoe crab numbers the quota should stay the way it is presently.

I fully support Jake Angelo's comments at the zoom meeting on March 4, 2026. He researched many sources on horseshoe crab numbers and their effects on other species. There is no data to support a need for further reduction.

I feel cutting the quota will cause undue hardship to the conch and dragger fisheries.

Thank you for your consideration of my comment.

Regards,

HenryBorges
220 Bakerville Road
Dartmouth, MA 02748

March 5, 2026

Dear Director McKiernan,

My name is Rachel Lynn, and I am a resident of West Barnstable, Massachusetts. I come from a fishing family that holds a conch pot license, and I have been following the management of the horseshoe crab fishery closely for several years.

In 2023, I attended a meeting at the Division of Marine Fisheries office in New Bedford where the initial reduction in the bait quota, from 165,000 to 140,000, was discussed. During that meeting, staff presented data showing a steady increase in horseshoe crab populations since the implementation of the lunar closures in 2010.

After that meeting, and hearing opposition from fishermen, the bait fishery was reduced by 25,000 horseshoe crabs. Then, in 2024, the “spring” horseshoe crab fishery was closed. Both measures have had real impacts on fishermen, and the hand-picking fishery has faced practical extinction as a result (addressed in the 12/12/25 memorandum).

Given these recent changes, I do not see a clear justification for further reductions geared toward the bait fishery at this time. Two significant management measures have already been implemented in a relatively short period: a reduction and a significant closure. An additional reduction of 40,000 crabs from the bait fishery would have ripple effects across multiple fisheries and throughout the Massachusetts seafood supply chain.

Horseshoe crab bait is essential for the conch fishery, and there is currently no viable substitute. As a result, every reduction in the bait quota directly limits fishermen’s ability to harvest conch.

It is also important to be cautious when evaluating quota changes based on short-term fishing trends. In recent years, price suppression in the conch market has reduced fishing effort, which, in turn, has affected reported landings and participation. Fishermen must often be nimble and shift effort to other fisheries when market conditions are weak. However, reducing the bait quota based on these temporary economic trends could prevent the conch fishery from recovering and returning to historic fishing levels when markets improve. There needs to be adequate bait.

I respectfully urge the Division to consider the cumulative impacts of the recent management decisions, as well as the data demonstrating the effectiveness of existing conservation measures, before pursuing further reductions to the bait quota. Any consideration of reallocating quota toward biomedical purposes should account for these cumulative effects and the longstanding role that horseshoe crab bait has played in supporting fisheries that feed people.

Thank you for your time and consideration.

Sincerely,

Rachel Lynn

February 24, 2026

Massachusetts Division of Marine Fisheries

836 S. Rodney French Blvd.

New Bedford, MA 02744

Attn: Director Daniel J. McKiernan

Subject: Public Comment on Proposed Horseshoe Crab Quota Transfer

Dear Director McKiernan,

Thank you for the opportunity to participate in public commentary. We respectfully submit the following comments regarding the Division's December 2025 proposal to transfer 40,000 horseshoe crabs from the bait quota to the biomedical quota, increasing the biomedical quota from 200,000 to 280,000 crabs annually.

Statement of Support for the Division's Proposal

Shellfish Broker LLC supports the Division's proposal, as presented at the December 2025 Marine Fisheries Advisory Commission meeting, to transfer 40,000 horseshoe crabs from the bait quota to the biomedical quota. This proposal reflects years of data and science-based management by the Division. Additionally, it represents a conservation-aligned approach to reducing overall horseshoe crab mortality while preserving the vital Rent-A-Crab program that services the important needs of the Massachusetts conch fishery.

The Massachusetts Division of Marine Fisheries has demonstrated a long-standing commitment to responsible stewardship of the Commonwealth's marine resources through rigorous monitoring, extensive field observation, and adaptive management grounded in science. With a staff of approximately 100, not including a fluctuating seasonal staff of approximately 25, the Division employs highly trained biologists, scientists, and fisheries managers who devote substantial effort and resources to ensuring that management decisions promote both conservation and sustainability and remain grounded in science.

Based on the Division's extensive monitoring programs, stock assessments, and operational oversight, this quota transfer represents a measured and appropriate adjustment that aligns quota allocation with observed patterns of utilization and

conservation objectives. Supporting this proposal will help ensure that a proportion of authorized harvest occurs within the biomedical category, where animals can be returned alive, thereby reducing overall mortality while also protecting the needs of the channeled whelk fishery.

For these reasons, we respectfully encourage the Marine Fisheries Advisory Commission to approve the Division's science grounded proposal as presented.

Because biomedical use allows for post-processing release and survival, maximizing access to biomedical quota prior to reliance on bait harvest helps reduce overall mortality. Ensuring that authorized biomedical quota can be fully utilized within established biomedical handling protocols helps ensure that the conservation objectives underlying this quota transfer are fully realized.

Our firm has consistently demonstrated the capacity to fully utilize its biomedical allocation and has historically met additional biomedical demand through lawful participation in the bait quota via the rent-a-crab program. This reflects the practical importance of ensuring that allocation structures support full and efficient utilization of authorized biomedical quota.

Ensuring that biomedical quota is structured in a manner that promotes full utilization within established biomedical handling protocols will help ensure that the intended conservation benefits of this quota transfer are fully achieved.

The Commonwealth of Massachusetts has demonstrated national leadership in the science-based stewardship of horseshoe crab resources. Supporting this proposal represents an important step in continuing that leadership and ensuring the long-term sustainability of this vital public trust resource for all stakeholders.

Thank you for your continued leadership and stewardship, and for the opportunity to provide these comments.

Respectfully submitted,

Shellfish Broker LLC

Chatham, Massachusetts

March 6, 2026

Massachusetts Division of Marine Fisheries

836 S. Rodney French Blvd.

New Bedford, MA 02744

Attn: Director Daniel J. McKiernan and Honorable Members of the Marine Fisheries Advisory Commission

Subject: Addendum Public Comment — Biomedical Horseshoe Crab Trip Limits

Dear Director McKiernan and Honorable Members of the Marine Fisheries Advisory Commission,

During the Division's recent public hearings regarding the proposed transfer of 40,000 horseshoe crabs from the bait quota to the biomedical quota, several commenters suggested that the current biomedical trip limit of 1,000 horseshoe crabs per day should be reduced to a level more closely aligned with the bait fishery trip limit of 300 crabs per day.

These suggestions were offered without supporting analysis, scientific justification, or operational explanation. For the benefit of the administrative record, and to assist the Commission in its deliberations, I respectfully submit the following clarifications.

First, the subject of biomedical trip limits is not part of the Division's current proposal.

The December 2025 memorandum and accompanying regulatory materials address only the reallocation of quota between the bait and biomedical sectors. No changes to biomedical trip limits were proposed, analyzed, or discussed in the Division's regulatory presentation.

Accordingly, altering biomedical trip limits within the context of this rulemaking would fall outside the scope of the proposal currently before the Commission.

Second, the current biomedical trip limit framework has been in place for many years and predates our firm's participation in the biomedical horseshoe crab industry. It is the framework set out by the DMF that we have adhered to.

The operational structure of the biomedical fishery—including vessel handling procedures, transport logistics, holding protocols, and compliance measures—has evolved over time within the context of this established regulatory model.

Our company's **Standard Operating Procedures,** under regulatory oversight, have been developed and refined over the last five years to ensure full compliance with the Best Management Practices established through the Atlantic States Marine Fisheries Commission and implemented through Massachusetts regulation in 2023. These practices represent the product of extensive collaboration among regulators, scientists, and industry participants with the shared conservation objective of minimizing horseshoe crab mortality associated with biomedical use.

Equally important, the extensive scientific monitoring conducted by the Massachusetts Division of Marine Fisheries, over years—including at-sea observations, dealer monitoring, and biomedical sampling—has been conducted within the framework of the current biomedical trip limit model. The resulting dataset, which has been presented annually during the Massachusetts Horseshoe Crab Science Meeting, reflects the performance of the fishery under the existing regulatory structure.

Introducing a substantial change to the biomedical trip limit would therefore introduce a new operational variable into a fishery management model that has been the basis for years of monitoring and scientific analysis. Such a change would complicate the interpretation of historical data and could make direct comparisons with past mortality and survivability observations far more difficult.

Most importantly, biomedical collection and handling procedures have been refined over many years with the explicit objective of minimizing stress and mortality among horseshoe crabs collected for biomedical purposes. These procedures—including vessel operations, transport timing, and holding practices—are designed around the operational and trip limit framework under which the fishery has functioned.

Substantial changes to that framework, including trip limit reductions, could alter operational patterns in ways that increase handling time, transportation complexity, or other stressors affecting horseshoe crab survivability. For this reason, any proposal to modify biomedical trip limits would warrant careful scientific evaluation before implementation.

Given that the Division's stated objective in the current proposal is to reduce overall horseshoe crab mortality by shifting allocation from the bait sector to the biomedical

sector, introducing unrelated regulatory changes to the biomedical fishery at this time could undermine the stability of the management framework that has produced the Division's current body of scientific observations.

The Massachusetts Division of Marine Fisheries has developed one of the most carefully monitored and scientifically managed horseshoe crab programs on the Atlantic coast. Maintaining stability in operational regulations that are not under consideration in the present proposal will help ensure that the Division's monitoring programs remain meaningful and that the conservation objectives underlying the current quota transfer are fully realized.

For these reasons, I respectfully encourage the Commission to limit its deliberations to the proposal currently before it and to maintain the existing biomedical trip limit structure unless and until a separate, science-based review of this issue is undertaken.

Thank you for your continued stewardship of the Commonwealth's marine resources and for your careful consideration of these comments.

Respectfully submitted,



Jamie Bassett

Shellfish Broker LLC

Chatham, Massachusetts

charles river

Director Daniel McKiernan
marine.fish@mass.gov

Re: Proposal on Horseshoe Crab Quota Management

Dear Director McKiernan,

Charles River Laboratories International, Inc. appreciates the opportunity to provide comments on the Massachusetts Division of Marine Fisheries' (MA DMF) proposal regarding horseshoe crab quota management. Your consideration of our commentary is appreciated.

Charles River Laboratories is headquartered in Massachusetts and employs more than 2,100 people across eleven sites throughout the Commonwealth and 19,000 globally. From pre-clinical trials to manufacturing, we are in the business of protecting human health. One of our major products contains Limulus Amebocyte Lysate ("LAL"), the most sensitive and accurate material to detect endotoxin contamination in many human healthcare products. LAL has a long history of criticality to the biopharmaceutical supply chain as a required step for the safe manufacture and distribution of every implantable medical device and injectable pharmaceutical.

LAL is currently the FDA-approved gold standard product for endotoxin contamination testing in biopharmaceutical products, and Charles River's LAL products are used to ensure the safety of approximately 50% of the global supply of implantable and injectable products. Without this vital and proven substance, the biopharmaceutical supply chain is susceptible to contamination and patient safety would be at risk. LAL is an extract from the blood of the horseshoe crab. LAL is collected in a highly controlled and monitored process in which the crabs are temporarily and humanely removed from and returned to their habitats.

Charles River Labs is proud to offer Trillium Recombinant Cascade Reagents (synthetic products that do not require extracts of horseshoe crab blood) in both vial and cartridge formats. USP Chapter <86> has created the opportunity for our customers to validate compatible new products and revalidate existing compatible product testing with recombinant endotoxin reagents. In practice, however, validation can be time-consuming and costly, and recombinant reagents are not compatible with all products or processes. Accordingly, there remains an urgent need for continued access to LAL derived from wild horseshoe crabs to meet current patient and public health needs.

Charles River Labs stands with MA DMF to protect the sustainable usage of horseshoe crab populations in Massachusetts. As a result, we are in support of the proposed amendments to 322 CMR 6.34 to (a) reduce the annual horseshoe crab bait quota from 140,000 to 100,000 crabs, and (b) reallocate these

40,000 crabs to the biomedical quota at a 1:2 ratio, increasing the biomedical limit from 200,000 to 280,000 crabs.

The proposed reallocation to the biomedical sector at a 1:2 ratio is materially more conservative than the empirical mortality would justify and will, in aggregate, decrease total mortality while meeting current biomedical demand. Because biomedical crabs are returned to sea—rather than harvested—mortality is significantly lower. Allowing 40,000 bait crabs to be reallocated as 80,000 biomedical crabs acknowledges this difference and results in a net reduction in overall horseshoe crab mortality.

To realize the intended benefits—conservation, public-health assurance, and economic stability—the quotas should be managed to enable full and efficient utilization. Full utilization ensures the biomedical sector can reliably perform required bacterial endotoxin testing, the bait sector retains a viable and predictable operating environment, and managers receive complete effort and catch-and-release data to support adaptive, evidence-based decision-making. Targeting full and efficient quota usage will improve transparency, year-over-year comparability, and future stock assessments.

The proposed amendments to 322 CMR 6.34 are consistent with sound, science-based fisheries management. They reduce overall mortality, protect public health through reliable LAL availability, sustain Massachusetts' economic activity and working waterfronts, and enhance long-term stock resilience. For these reasons, Charles River Laboratories respectfully urge adoption of the quota adjustments and management for full, efficient utilization.

Charles River remains committed to responsible stewardship of horseshoe crab populations and continued collaboration with regulators, fishermen, and scientific partners. We thank the MA DMF and MA Marine Fisheries Advisory Commission for their consideration of these points and their support and stewardship of this vital and life-saving population and fishery.

Sincerely,



Nora Blair, Associate Director of Endosafe Testing and Natural Resource Conservation, Charles River Labs

From: Mass Audubon on behalf of Brennan Foley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, March 5, 2026 7:22:48 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 5, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Brennan Foley
23 Crabtree road
plymouth, MA 02360
(774) 773-5699
bjfoley15@gmail.com

From: Mass Audubon on behalf of Ann Armstrong
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, March 4, 2026 7:51:43 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 4, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ann Armstrong
92 Oakley Rd
Belmont, MA 02478-2764
(617) 484-3752
alarm46@comcast.net

From: Mass Audubon on behalf of Jac-Lynn Stark
To: Marine Fish (FWE)
Subject: Horseshoe Crab Protection
Date: Wednesday, March 4, 2026 2:21:14 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 4, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I was part of the advocacy campaign by Mass Audubon in 2024 to help pass 322 CMR 6.34 to support regulations to protect horseshoe crabs during the spawning season. While that was a good first step, reducing the bait harvest quota will be another important step toward protecting these ancient and environmentally important creatures.

As humans, I feel it is important for us to protect the natural world, including animals, from destruction. As some people say, there is no Planet B. The horseshoe crab as a species is more than 300 million years old. It would be a shame for their numbers to continue to decrease, especially since their eggs provide food for the endangered red knots as they migrate from the southern tip of South America to the Arctic.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jac-Lynn Stark
60 Breed Street, #4
Lynn, MA 01902-3160
(617) 230-7377
jaclynn10@yahoo.com

From: Mass Audubon on behalf of Sarah Robbins
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, March 4, 2026 9:20:41 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 4, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah Robbins
485 Common St
Belmont, MA 02478-4470
(781) 894-3006
sarinkax@yahoo.com

From: Mass Audubon on behalf of Maureen Quinn-Dupont
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, March 3, 2026 11:19:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 3, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Maureen Quinn-Dupont
86 South Street 3B
Boston, MA 02111
(617) 412-1559
mqddwd@gmail.com

From: Mass Audubon on behalf of daniel callahan
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Tuesday, March 3, 2026 12:48:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 3, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

They haven't survived for so long to be wiped out like this!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. daniel callahan
14 Cottage
Stoneham, MA 02180
(781) 254-1923
danpcal6194@gmail.com

From: Mass Audubon on behalf of Monica Buck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, March 3, 2026 10:48:25 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 3, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Monica Buck
31 Keyes Street
West Boylston, MA 01583
(978) 503-8210
monicambuck@gmail.com

From: Mass Audubon on behalf of Zachary John
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, March 3, 2026 10:48:24 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 3, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Zachary John
31 Keyes St
West Boylston, MA 01583
(978) 906-3151
zachjmusic@gmail.com

From: Mass Audubon on behalf of Maureen Sundberg
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, March 2, 2026 7:49:40 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 2, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Shorebirds are among the most rapidly declining group of birds, and horseshoe crab eggs can provide them with crucial fuel for migration. Please support a reduction in the harvest of horseshoe crabs.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maureen Sundberg
23 Oak St
Andover, MA 01810
(978) 470-2100
rrsundberg23@gmail.com

From: Mass Audubon on behalf of Jonathan McCurdy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, March 2, 2026 6:16:38 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 2, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jonathan McCurdy
47 Rossmore Road
Jamaica Plain, MA 02130
(857) 208-2419
jsmccurdy@earthlink.net

From: Mass Audubon on behalf of Carol Gomez
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, March 2, 2026 5:16:30 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 2, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carol Gomez
4 Perkins Rd
Danvers, MA 01923
(978) 774-2438
cg.rocks@verizon.net

From: Mass Audubon on behalf of Hailey Cocorochio
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, March 2, 2026 3:16:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 2, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Why do we think were just allowed to deny this species a bountiful life? These beautiful crustaceans deserve to witness life just as much as we do, and we should let them do so without getting all up in their business. People commonly want to live in peace, they probably do as well.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Hailey Cocorochio
70R Loring Ave Salem State University
Salem, MA 01970
(857) 320-9997
haileyr1117@gmail.com

From: Mass Audubon on behalf of Mary Ann Leekley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, March 2, 2026 8:45:34 AM

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Mar 2, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Ann Leekley
17 Margaret Rd
South Hamilton, MA 01982
(888) 555-1212
maleekley@yahoo.com

From: Mass Audubon on behalf of Carla Falasco
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 10:50:09 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carla Falasco
14 Sherwood Rd
Natick, MA 01760-3309
(440) 773-2806
cfalasco@jdrf.org

From: Mass Audubon on behalf of Susan Fisher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 9:30:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are an ancient and now threatened species and an important part of our ecosystem, their eggs feeding birds on MA shores. Please help them survive this demand for their use by humans.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Fisher
50 Cushing St Cambridge Ma 02138
Cambridge, MA 02138
(617) 312-8337
susanmfisher@gmail.com

From: Mass Audubon on behalf of Sargon Donabed
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 9:30:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Sargon Donabed
40 St Marys Rd
Milton, MA 02186
(617) 510-7527
sargondonabed@gmail.com

From: Mass Audubon on behalf of Sheila Ferguson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 7:49:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sheila Ferguson
23 Patrick St
Arlington, MA 02474
(781) 999-9999
spff23@gmail.com

From: Mass Audubon on behalf of Cynthia Franklin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 5:49:51 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Shorebirds are among the most rapidly declining group of birds. Horseshoe crab eggs are a crucial resource for these and other global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden.

I have been watching horseshoes crabs come up on the beaches of Wellfleet to lay their eggs since the early 1970s, and my husband's experience goes back to the 1950s. The decline in their numbers has been obvious and disheartening. I would much prefer to see the bait harvest eliminated all together, but am very pleased to support this proposed reduction.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cynthia Franklin
POBox 462
So. Wellfleet, MA 02663
(508) 349-1633
cynthia.franklin42@gmail.com

From: Mass Audubon on behalf of Liza Connelly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 2:00:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Liza Connelly
60 Glen Road #T8
Brookline, MA 02445
(617) 910-7093
liza_connelly@yahoo.com

From: Mass Audubon on behalf of Paul Toomey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 2:00:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Paul Toomey
60 Glen Road #T8
Brookline, MA 02445
(617) 910-7093
pauljtoomey@yahoo.com

From: Mass Audubon on behalf of Kim Sterrett
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 1:00:04 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kim Sterrett
73 Bowman Street
Malden, MA 02148
(781) 439-8500
mightymousemc3@yahoo.com

From: Mass Audubon on behalf of Karin Peterson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 12:30:04 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As you know, Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Karin Peterson
401 Essex St. #216
Beverly, MA 01915
(508) 498-1575
khopepath@gmail.com

From: Mass Audubon on behalf of Meg McCormack
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, March 1, 2026 11:49:22 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Save the crabs please.
They are so cool and we need them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Meg McCormack
2 Timberline Dr
Norfolk, MA 02056
(508) 446-4035
nutmegs6@gmail.com

From: Mass Audubon on behalf of F T
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 11:48:13 PM

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Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. F T
388 River rd
Westport, MA 02790
(508) 636-2750
jestersincorperatedgames@gmail.com

From: Mass Audubon on behalf of McKenzie Blair
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 9:29:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. McKenzie Blair
150 Bishop Street
Attleboro, MA 02703-3221
(508) 208-9081
mckenzie_b_blair@yahoo.com

From: Mass Audubon on behalf of Brian Harrington
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 6:47:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds and who knows what else; Shorebird populations are crashing, apparently (in most species) because of declines of key foods at migration stopover places.

But more importantly, any harvest that targets breeding populations of any animal is sure to descimate its populations. Resource agencies like DNR surely know this, so I applaud reducing the lethal bait harvest of breeding Limulus.

Thank you for "walking the tightrope" and doing the right thing.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Brian Harrington
205 Valley Rd
Plymouth, MA 02360-7000
(774) 487-2683
brian.harrington205@gmail.com

From: Mass Audubon on behalf of Laurie Grandmont
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 4:47:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

On a more personal note Director, I have championed the horseshoe crab's unique life to our ecosystem by bringing this amazing "living fossil" to my urban middle school classroom, during ocean adventures, and within an illustrated field notes section. In my research I have learned that there are synthetic alternatives of their blood. Stopping this biomedical harvest through these synthetic alternatives is best practice. For more information, I would encourage you to review them at https://urldefense.com/v3/__https://www.horseshoes.org__;!!CPANwP4y!SB85IgpW25PbUGNwcXN45jEj4qBQylPuVKQiyfUUbieibKz5f4GWInYiDF5cbcGDQ0osmh8z34MS4F8h4FesAdt4bQ$. and locally at https://urldefense.com/v3/__http://www.necwa.org__;!!CPANwP4y!SB85IgpW25PbUGNwcXN45jEj4qBQylPuVKQiyfUUbieibKz5f4GWInYiDF5cbcGDQ0osmh8z34MS4F8h4FdpfomQwg$.

Thank you for adopting the synthetic alternatives and not directly harvesting the blood of horseshoe crabs

Thank you,
Sincerely,
Laurie Grandmont
lagrandmont@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Laurie Grandmont
44 Puritan Road
Buzzards Bay, MA 02532
(509) 759-3757
lagrandmont@gmail.com

From: Mass Audubon on behalf of Elizabeth Mawrey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 2:28:43 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Mawrey
17 Birch St
Quincy, MA 02171
(508) 808-4850
elizabeth@mawrey.com

From: Mass Audubon on behalf of Alison Mawrey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 2:17:21 PM

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Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are a critical part of the ecosystem along our shore. I'm blessed to live on Cape Cod and value the importance of protecting these ancient creatures.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Alison Mawrey
172 Daniels Island Road
Mashpee, MA 02649
(508) 641-6643
alison@mawrey.com

From: Mass Audubon on behalf of Lisa DAmato
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 1:58:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lisa DAmato
9 Mari Jane Rd
West Dennis, MA 02670-2608
(781) 789-1996
ljdamato62@gmail.com

From: Mass Audubon on behalf of Leonard DiLorenzo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 1:47:19 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Leonard DiLorenzo
5 Harbor Bluff Rd
Hyannis, MA 02601-4719
(506) 775-7123
amglad1@comcast.net

From: Mass Audubon on behalf of Brooke Moncrieff
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 1:28:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Brooke Moncrieff
75 Capitol Street
Watertown, MA 02472
(617) 840-3452
bmoncrieff1@gmail.com

From: Mass Audubon on behalf of Jennifer Campbell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 12:47:09 PM

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Feb 28, 2026

Director Daniel McKiernan

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

With both pharmaceutical regulators and the biomedical industry moving toward synthetic alternatives, it's time to decrease--not increase--the number of crabs subjected to this inhumane process. Fifteen to 30 percent of horseshoe crabs do not survive this ordeal, and those who do may have compromised welfare for weeks afterward.

A synthetic, animal-free alternative using recombinant factor C (rFC) reagents has been available commercially since 2004, and was recently officially endorsed by the US Pharmacopeia, which sets federal quality standards for pharmaceuticals. Some major biomedical companies, such as Eli Lilly and GSK, have already made substantial progress in implementing synthetic alternatives for their endotoxin testing, while others are at varying points in the transition. To increase the biomedical harvest quota now would be to de-incentivize the transition to humane alternatives.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennifer Campbell
12B Willow Ct
Arlington, MA 02476
(617) 417-9342
inventedroses@gmail.com

From: Mass Audubon on behalf of Mikayla von Ehrenkrook
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 12:17:06 PM

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Feb 28, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mikayla von Ehrenkrook
79 East High Street
AVON, MA 02322
(508) 942-7654
mikaylavonehrenkrook@gmail.com

From: Mass Audubon on behalf of Jennifer Falcon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 11:47:05 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennifer Falcon
176 Lincoln St apt b3 Worcester, MA, USA
Worcester, MA 01605
falconjenn@yahoo.com
falconjenn@yahoo.com

From: Mass Audubon on behalf of David Peake-Jones
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 10:58:28 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crabs, of course, have conservation value in their own right, but the use of their eggs as a feeding resource by endangered shorebirds makes the species a linchpin in marine systems.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Peake-Jones
25 Clark Street
Easthampton, MA 01027
(413) 529-9541
dmpeakejones@gmail.com

From: Mass Audubon on behalf of Sharon C
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 10:16:56 AM

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Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sharon C
13 Hanson Rd
Charlton, MA 01507
(508) 523-4403
scaulway@massaudubon.org

From: Mass Audubon on behalf of Carole McCarey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 9:58:24 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carole McCarey
699 Main Street
Cotuit, MA 02635
(508) 428-8172
cotuitcarole@gmail.com

From: Mass Audubon on behalf of Kezia E Bacon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 9:46:52 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kezia E Bacon
110 Stagecoach Drive
Marshfield, MA 02050
(781) 837-7093
hellokezia@verizon.net

From: Mass Audubon on behalf of Jonathan Clapp
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 8:28:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jonathan Clapp
335 Oak St
Harwich, MA 02645
/
j_w_clapp@hotmail.com

From: Mass Audubon on behalf of Jessica Bryant
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 7:58:19 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I have fond memories of seeing horseshoe crabs on the beach as a kid. They've become an increasingly rare sighting these days. Please act to protect this iconic species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jessica Bryant
55 Chilton St. Apt 3
Cambridge, MA 02138
(774) 217-1395
jessawbryant@gmail.com

From: Mass Audubon on behalf of Susan Martone
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 7:46:39 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 28, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Susan Martone
20 Mowry Street
Mendon, MA 01756
smmartone@comcast.net

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Martone
20 Mowry St
Mendon, MA 01756-1220
(774) 573-0777
smmartone@comcast.net

From: Mass Audubon on behalf of Mae Klinger
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 28, 2026 6:46:38 AM

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Feb 28, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mae Klinger
19 Loring St
Belmont, MA 02478
(401) 486-7297
mae.klinger@gmail.com

From: Mass Audubon on behalf of Harold Schaut
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:46:03 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Harold Schaut
345 Harrison Ave Apt 1438
Boston, MA 02118
(608) 698-1497
schauthj@gmail.com

From: Mass Audubon on behalf of Christina Ullrich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:27:40 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

It is so vital that we've protect horseshoe crabs for many, many reasons. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. In addition, horseshoe crabs populations themselves are in danger. Who your crabs have given us so much already, and include.Long serving an important role in Covid vaccines. Please do all that you can to protect these important creatures. They deserve it!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Christina Ullrich
257 Common St
Dedham, MA 02026
(617) 935-3832
ckullrich@gmail.com

From: Mass Audubon on behalf of Taylor Marston
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:15:59 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Taylor Marston
91 Dysart st
Quincy, MA 02169
(617) 678-1858
tmmarston27@gmail.com

From: Mass Audubon on behalf of John Foresteire
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 9:57:33 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. John Foresteire
9 Illinois Rd
Tewksbury, MA 01876
(978) 658-8915
j.foresteire@comcast.net

From: Mass Audubon on behalf of Gail Koza
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 9:46:11 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 27, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Gail Koza
19 Casper Circle
Mashpee, MA 02649-2450
(650) 276-9518
gkkoza@gmail.com

From: Mass Audubon on behalf of Lenae Fiora
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 8:45:53 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lenae Fiora
20 Ellington Rd
Somerville, MA 02144
(781) 862-6495
lenaefiora1@gmail.com

From: Mass Audubon on behalf of Ainsley Donaldson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 8:27:31 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

This effort to conserve is LONG OVERDUE.. PLEASE PROCEED WITH HASTE!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ainsley Donaldson
44 Marmion Road
Melrose, MA 02176
(781) 665-5468
ainsleyd@aol.com

From: Mass Audubon on behalf of Alexis Thrul
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 8:15:56 PM

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Feb 27, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alexis Thrul
12 Marywood St
Uxbridge, MA 01569
(508) 404-5554
lexthrul@gmail.com

From: Mass Audubon on behalf of Patricia Coan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 7:15:46 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Summary: It's just not about US but the bigger world including wildlife.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Patricia Coan
23 Gardner St
`Peabody, MA 01960-1812
(978) 531-1154
atlantic.gsd@gmail.com

From: Mass Audubon on behalf of Jessica Becker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 7:15:45 PM

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Feb 27, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jessica Becker
408 Technology Center Dr Unit 5309
Stoughton, MA 02072-4741
(617) 584-4732
jmb8907@gmail.com

From: Mass Audubon on behalf of Linda Cornell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 7:15:43 PM

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Feb 27, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Why wouldn't we want to try to protect the coastal environment? So much depends on the coast here in Massachusetts...the birdlife, the sea life as well as all the enjoyment we get from the beaches and the shore birds. In recent history we have destroyed so much of what keeps us part of the earthly community. It's shameful. Please stop the practice of killing what has made us special.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Linda Cornell
500 Barneys Joy Rd
South Dartmouth, MA 02748
(508) 636-2769
lindyc@davecornellcharters.com

From: Mass Audubon on behalf of Cathleen Godzik
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 5:15:36 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds and need to be protected. The red knot is a federally protected shore bird that feeds on these crabs eggs
Also, overharvesting of horseshoe crabs for medical purposes should be banned - this harvesting for medicinal purposes is banned in New York.
Please approve DMF's horseshoe crab prop on your upcoming vote to protect horseshoe crab populations.
Sincerely, Cathleen A. Godzik, MD
58 CoveView Drive
South Yarmouth, MA 02664
cagblueice@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Cathleen Godzik
58 CoveView Dr
South Yarmouth, MA 02664
(213) 482-6103
cagblueice@gmail.com

From: Mass Audubon on behalf of Megan Gordon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 5:15:36 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Hi, I'm concerned about the horseshoe crab population, and really encourage the Division to pass these new rules to protect our iconic species.

Thank you,
Megan

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Megan Gordon
77 Egerton Rd
Arlington, MA 02474
(603) 660-8523
megan.gordon238@gmail.com

From: Mass Audubon on behalf of Cassie Marando
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 5:15:35 PM

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Feb 27, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cassie Marando
1105 Plymouth St
Abington, MA 02351
(508) 577-6459
cassie.marando@gmail.com

From: Mass Audubon on behalf of Pauline Entin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 4:15:28 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are an ancient and remarkable animal. They survived the rise and fall of dinosaurs and all the natural phenomena since then. While their unique blood has literally saved human lives (via its use in biomedicine) and is still needed for medical applications, there is no reason for horseshoe crabs to be done in by humans. We don't need to harvest them as bait. That's a waste. Please support the proposal that would decrease the use of this irreplaceable natural resource for bait.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Pauline Entin
32 Gulf Hill Drive
South Dartmouth, MA 02748
(928) 380-2376
pentin@gmail.com

From: Mass Audubon on behalf of Eileen Feeney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 4:15:28 PM

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Feb 27, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Eileen Feeney
11 Clarendon Street
Weymouth, MA 02190
(339) 788-2664
leenmarie352@yahoo.com

From: Mass Audubon on behalf of Ashley Makridakis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 3:57:06 PM

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Feb 27, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ashley Makridakis
65 Peakham Rd.
SUDBURY, MA 01776
(508) 397-9708
freshstartwildlife@gmail.com

From: Mass Audubon on behalf of Kathleen Florentine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 3:57:06 PM

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Feb 27, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Kathleen Florentine
2 AYR RD
Brighton, MA 02135
(937) 238-1987
kathleen.florentine@gmail.com

From: Mass Audubon on behalf of Karen Furlong
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 3:45:26 PM

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Feb 27, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Karen Furlong
74 BAYSWATER ST
Boston, MA 02128
(928) 460-2421
karenfurlong25@gmail.com

From: Mass Audubon on behalf of Kristin Whelton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 3:27:05 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kristin Whelton
45 Washburn Ave
Wellesley, MA 02481
(917) 733-1873
kmb@sloan.mit.edu

From: Mass Audubon on behalf of Jennifer Feeney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 3:15:23 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennifer Feeney
770 HANCOCK ST
QUINCY, MA 02170
(781) 975-9182
jennfeeney16@gmail.com

From: Mass Audubon on behalf of Mike Travers
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 2:57:03 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Mike Travers
19 Clipper Cir
Sandwich, MA 02563
(508) 566-1588
ecogeekpest@gmail.com

From: Mass Audubon on behalf of Julia Driscoll
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 2:45:21 PM

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Feb 27, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Julia Driscoll
249 MAIN ST
Kingston, MA 02364
(781) 264-5065
juliadriscoll93@gmsil.com

From: Mass Audubon on behalf of Georgia Neill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 2:27:04 PM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

We must protect horseshoe crabs from over harvesting!
Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Georgia Neill
PO Box 806
North Truro, MA 02652
(508) 487-7591
georgianeill@comcast.net

From: Mass Audubon on behalf of Renelle Hebert
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 2:27:03 PM

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Feb 27, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Renelle Hebert
10 Creston Avenue
Woburn, MA 01801
(781) 938-1023
renelle.hebert@gmail.com

From: Mass Audubon on behalf of Emily Szczypek
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 2:27:03 PM

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Feb 27, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. I have been watching shorebirds in Winthrop and Revere since 2008. I also travel to Cape Cod, Parker River and other areas to witness the short span of time we have with shorebirds. Please help the declining number of shorebirds sustainability by saving the lives of 28,000 horseshoe crabs annually.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Emily Szczypek
241 School St.
Waltham, MA 02451
(781) 879-2204
plover08@yahoo.com

From: Mass Audubon on behalf of Shreya Mishra
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 1:15:17 PM

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Feb 27, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Shreya Mishra
56 alleghany st
Boston, MA 02120
(330) 998-4967
shreya81mishra@gmail.com

From: Mass Audubon on behalf of David Abel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 1:15:17 PM

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Feb 27, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I grew up on the bay in Brewster and have watched the dramatic decline in numbers from the 1960's till now, and, disturbingly, a significant decline in just the past 3-5 years.
There is no reason to harvest any horshoecrabs and I support any efforts to halt this short-sighted and selfish practice.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Abel
26 Captain Curtis Way
Orleans, MA 02653
(617) 794-6941
dabel4solar@gmail.com

From: Mass Audubon on behalf of Carol Carlson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 12:15:11 PM

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Feb 27, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carol Carlson
15 Fayette Street
Boston, MA 02116
(617) 777-4247
carlson@krulewitch.com

From: Mass Audubon on behalf of Sarah Gladstone
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 11:45:06 AM

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Feb 27, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Sarah Gladstone
4 Evergreen Ln.
AMHERST, MA 01002
(313) 525-6986
smgladstone@hotmail.com

From: Mass Audubon on behalf of LAKSHMI SRINIVAS
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 11:45:06 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. LAKSHMI SRINIVAS
14 West Street
Arlington, MA 02476
(617) 992-1948
srinivasl@rcn.com

From: Mass Audubon on behalf of Meghan Watts
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 11:45:06 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Meghan Watts
68 Yale Rd
Pembroke, MA 02359
(617) 785-0358
meghan.dowdall@gmail.com

From: Mass Audubon on behalf of Twyla Schran
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:44:58 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Twyla Schran
25 Knapp St
Somerville, MA 02130
(857) 321-1441
twylaschran@yahoo.com

From: Mass Audubon on behalf of Dennis Picker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:26:52 AM

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Feb 27, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There are viable options for totally eliminating the use of horseshoe crab blood by the pharmaceutical industry.

Please follow the lead set by New Jersey regarding horseshoe crab harvesting.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Dennis Picker
58 PAGE RD
LINCOLN, MA 01773-2806
(781) 507-1418
dennis.picker0@gmail.com

From: Mass Audubon on behalf of Susan Racette
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:14:55 AM

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Feb 27, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Racette
22 Greenfield Terr
Scituate, MA 02066
(781) 545-7803
teatimetuffet@aol.com

From: Mass Audubon on behalf of James Armstrong
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:14:55 AM

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As a child, I spent countless hours at Duxbury Beach on the Bayside playing with horseshoe crabs the thought that they could be endangered to the point of near nonexistence is untenable. I ask you to please institute this act to save a precious resource.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James Armstrong
62 Cornell Rd
Marblehead, MA 01945-2140
(617) 834-6778
rollright@aol.com

From: Mass Audubon on behalf of Marcella Ashley-Selleck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 10:14:54 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Marcella Ashley-Selleck
3661 Main St
Brewster, MA 02631
(802) 349-0139
marcyashleyselleck@outlook.com

From: Mass Audubon on behalf of Joanne Hubbard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 9:56:49 AM

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Feb 27, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Our environment is so intertwined, These crabs are important to save.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There must be plenty of other options for bait for fishermen than endangered species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Joanne Hubbard
93 Cherry St
Shrewsbury, MA 01545
(508) 842-4895
jojoh@townisp.com

From: Mass Audubon on behalf of Eliza Anderson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 9:14:47 AM

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Feb 27, 2026

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Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Killing horseshoe crabs for bait is senseless and short-sighted, and it seems crazy to me that their very existence is threatened by such behavior. Especially when we--or you, as the group responsible for this decision--have such power to reverse the species' decline. Please vote yes to protect horseshoe crabs!
Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Eliza Anderson
26 Brooks St.
Concord, MA 01742
(781) 572-1612
emscji@gmail.com

From: Mass Audubon on behalf of Vivien Goldman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 9:14:46 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Vivien Goldman
777 Winchester St. Apt 7509
Newton, MA 02549
(617) 699-8197
viviengoldman@comcast.net

From: Mass Audubon on behalf of Charles Crosby
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 8:56:47 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Charles Crosby
17F Hennery Way
Medfield, MA 02052
(978) 935-0411
ccrosby5@yahoo.com

From: Mass Audubon on behalf of Christie Higginbottom
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 8:56:47 AM

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Feb 27, 2026

Director Daniel McKiernan

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We in New England are fortunate to have the horseshoe crab, this rare prehistoric species that continues to play a significant role in the coastal ecosystem. I have special memories of finding them while vacationing on Cape Cod, and my grandchildren have shared that wonder. To use them as bait and risk losing this species is foolhardy. We must end that practice and celebrate this rare and unusual species.
Christie Higginbottom

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Christie Higginbottom
26 Craig St.
Rochdale, MA 01542
(508) 892-1160
cjh-garden@earthlink.net

From: Mass Audubon on behalf of Amanda Maloney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 8:14:43 AM

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Feb 27, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Amanda Maloney
24 KILBY ST
Woburn, MA 01801-2958
(646) 369-3866
amandaamaloney@gmail.com

From: Mass Audubon on behalf of Andres Calvo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 7:14:40 AM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Andres Calvo
43 Pomeworth st
Stoneham, MA 02180
(862) 621-3634
andres.calvo23@gmail.com

From: Mass Audubon on behalf of Susan Caruso
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 6:26:40 AM

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Feb 27, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Susan Caruso
11 Westmoreland Ave
Arlington, MA 02474
(339) 223-9569
susancaruso@mac.com

From: Mass Audubon on behalf of Kelly Dissing-Olesen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 5:26:37 AM

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Feb 27, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Kelly Dissing-Olesen
11 Leland Rd
Norfolk, MA 02056-1222
(857) 998-8762
kellyannolesen@gmail.com

From: Mass Audubon on behalf of Katherine Slocum
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 2:44:20 AM

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Feb 27, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Katherine Slocum
142 Magnet Way
Brewster, MA 02631
(508) 240-4905
kaslocum@gmail.com

From: Mass Audubon on behalf of Kathleen Donovan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 12:26:19 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Donovan
25 Fountain St Unit 206
Roxbury, MA 02119
(781) 534-1468
katiedonovan04@gmail.com

From: Mass Audubon on behalf of Cayce Wegman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:56:13 PM

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Feb 26, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Cayce Wegman
20 Washington St.
North Easton, MA 02356
(774) 273-1721
cayceleemarie@gmail.com

From: Mass Audubon on behalf of Rowan Mulder
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:13:53 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Rowan Mulder
135 Old Ferry Rd
Newburyport, MA 01950
(978) 810-5228
purpletortoise2@gmail.com

From: Mass Audubon on behalf of Jessica Buster
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:56:10 PM

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Feb 26, 2026

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Considering how essential the use of horseshoe crabs are to the biotech and pharmaceutical industries, it's ridiculous that this species is still fished for bait when so many other options for bait are available. The bait fishing should be completely phased out as long as there is no synthetic source of the endotoxin test.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jessica Buster
164 Derby Road
Melrose, MA 02176
(603) 252-0205
jjbuster@gmail.com

From: Mass Audubon on behalf of Ariane St claire
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:13:50 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ariane St claire
800 old post rd
Cotuit, MA 02635
(774) 361-8905
ariadnemelian@gmail.com

From: Mass Audubon on behalf of Harry Newell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:43:48 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I hope one day soon the harvesting of horseshoe crabs will be supplanted by synthetic compounds for medical purposes. I hope we soon phase out the harvest for bait just like we long ago ended the harvest for fertilizer.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Harry Newell
19 Deer Path Unit 4
Maynard, MA 01754-1486
(781) 742-8408
h.newell@hey.com

From: Mass Audubon on behalf of Sandra Veillette
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:26:00 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Once again, this precious creature features an important role in balance of nature and allowing these creatures to have the wild and wonderful life they deserve.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sandra Veillette
111 Summit Rd
Richmond, MA 01254-5134
(413) 698-3411
ronsanveil@gmail.com

From: Mass Audubon on behalf of Irene Sedlacko
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:13:48 PM

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Sincerely,

Ms. Irene Sedlacko
60 Elm Street
Wakefield, MA 01880
(781) 246-2605
irenesedlacko@gmail.com

From: Mass Audubon on behalf of Maggie Shields
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:56:01 PM

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Sincerely,

Ms. Maggie Shields
21 Turners Falls Rd Apt D
Turners Falls, MA 01376
(508) 344-6285
firstlight369@icloud.com

From: Mass Audubon on behalf of Elaine Daley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:43:42 PM

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Sincerely,

Ms. Elaine Daley
28 Whidah Dr
Harwich, MA 02645
(617) 512-8557
edaley100@gmail.com

From: Mass Audubon on behalf of Eleanor Denault
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:43:37 PM

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Sincerely,

Ms. Eleanor Denault
8 Apache Way
Tewksbury, MA 01876-4609
(978) 851-7164
eleanordenault@gmail.com

From: Mass Audubon on behalf of Peter Wade
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:25:47 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Peter Wade
210 Widgeon Drive
Eastham, MA 02642
(508) 237-1399
phwade@comcast.net

From: Mass Audubon on behalf of Kalei Ensminger
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:13:35 PM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kalei Ensminger
28 Putnam St
Beverly, MA 01915
(585) 465-3166
kalei.ensminger@gmail.com

From: Mass Audubon on behalf of Ian Smythe
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:13:34 PM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ian Smythe
764 Stony Hill Road
Wilbraham, MA 01095
(617) 910-7137
cryhavc@gmail.com

From: Mass Audubon on behalf of Bethanie Petitpas
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:13:34 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Bethanie Petitpas
1 Kneeland Road
Tewksbury, MA 01876
(978) 658-4581
bnpqoe@hotmail.com

From: Mass Audubon on behalf of Lynn Dewey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:55:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Sincerely,

Mrs. Lynn Dewey
59 Northbridge Rd
Mendon, MA 01756
(617) 799-2181
lynnhdewey@gmail.com

From: Mass Audubon on behalf of Cindy White
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:13:31 PM

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Feb 26, 2026

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Sincerely,

Ms. Cindy White
137 Emerson Way
Florence, MA 01062
(413) 297-0174
whitecl@comcast.net

From: Mass Audubon on behalf of Jean Calautti
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:13:31 PM

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Sincerely,

Mrs. Jean Calautti
97 Sutherland Rd
North Attleborough, MA 02760
(508) 699-4343
jdcalautti@gmail.com

From: Mass Audubon on behalf of Gwen Holt
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:55:37 PM

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Feb 26, 2026

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When I was a child growing up in Mattapoisett I remember the beach would sometimes be covered with living horseshoe crabs. Many decades later, I am lucky to be able to walk at Crane Beach in Ipswich in the early mornings. Now there are just a few horseshoe crab shells that wash up now and then. I read a great book about them "The Narrow Edge" by Deborah Cramer which points out how ancient they are, and what an important role they play in in the life cycle of migratory birds. It is a waste to use them as bait, and there are now alternatives to biomedical uses. I support any measure that reduces the needless killing of this important species.

Thanks for you time,
Gwen Holt
Hamilton, MA
gwen.holt@icloud.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Gwen Holt
PO Box 225
Hamilton, MA 01936
(978) 468-0067

gwen.holt@icloud.com

From: Mass Audubon on behalf of Charles Kellner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:43:27 PM

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Feb 26, 2026

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Sincerely
Charles Kellner
Clinton, MA

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Charles Kellner
33 Beech St
Clinton, MA 01510
(973) 575-9800
chazz.kellner@gmail.com

From: Mass Audubon on behalf of Mary Handy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:43:27 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Handy
269 Old Jail Lane
Barnstable, MA 02630
(216) 262-3775
pollyhandy@mac.com

From: Mass Audubon on behalf of Joan Stoner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:25:37 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I spent my youth on Cape Ann and horseshoes crabs were abundant along those shores in the 50s. Now I have rarely see any. It apparently they are threatened and their numbers have dropped. Please protect them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Joan Stoner
23 Minute Man Lane
Lexington, MA 02421
(781) 862-0671
jsstoner@gmail.com

From: Mass Audubon on behalf of Anthony Butkus
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:13:26 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
While at Holy Cross I researched a paper concerning horseshoe crabs and understand the importance of these ancient creatures.
I have a home on the Wareham river where I have witnessed their decline during their breeding season and implore you to support all efforts to conserve them.
Sincerely
Tony Butkus
Ex NAUI/PADI/YMCA Scuba Instructor

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Anthony Butkus
15 Barclay St.
Worcester, MA 01604
(508) 667-3555
akbutkus@gmail.com

From: Mass Audubon on behalf of Cynthia Brown
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:13:26 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
It is also unnecessary to continue to bleed horseshoe crabs for the biomedical industry as there are now readily available synthetic alternatives.
The use of horseshoe crabs for bait is to support international foods, not domestic uses.
Both of these uses for horseshoe crabs should cease immediately

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Cynthia Brown
69 Skytop Road
Ipswich, MA 01938-1484
(508) 729-1508
cynthiabro@gmail.com

From: Mass Audubon on behalf of Anne Leone
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:13:25 PM

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Sincerely,

Ms. Anne Leone
51 Long Ave
Framingham, MA 01702-5735
(617) 459-9808
leoneannem@gmail.com

From: Mass Audubon on behalf of Michelle Hague
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:13:25 PM

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Sincerely,

Mrs. Michelle Hague
48 Birch Ln
Brewster, MA 02631-2114
(087) 760-9330
th3bldr@c4.net

From: Mass Audubon on behalf of Julia Yoshida
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:13:25 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Horseshoe crabs have contributed to human medicine in 2 ways: (1) Dr. H.K. Hartline studied a large nerve cell in the eye of these crabs and identified "lateral inhibition" in neuronal activity which was new to science (Nobel 1967). This information has contributed to better understanding of the human nervous system. (2) horseshoe crab blood is used to conduct specific useful blood tests, but today a synthetic substitute blood is also available. No reason to risk losing this species because of continued blood draws. It would be tragic if we lost the species because we did not stop blood draws and transitioned to using already available blood assays.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Julia Yoshida
PO Box 726
Concord, MA 01742
(978) 617-5189
julia@sunsetharrier.com

From: Mass Audubon on behalf of Glorianna Davenport
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:55:38 PM

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Sincerely,

Ms. Glorianna Davenport
139 Bartlett Rd
Plymouth, MA 02360-1595
(508) 224-7720
gid@media.mit.edu

From: Mass Audubon on behalf of Elizabeth Dierze
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:55:37 PM

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Sincerely,

Mrs. Elizabeth Dierze
29 Colrain Road
Topsfield, MA 01983
(978) 360-2396
edierze@gmail.com

From: Mass Audubon on behalf of Judith Campbell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:55:37 PM

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Sincerely,

Dr. Judith Campbell
36 Richdale Rd
Needham, MA 02494
(781) 468-8252
judyleecampbell1@gmail.com

From: Mass Audubon on behalf of Pamela Cooke
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:43:21 PM

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Feb 26, 2026

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Sincerely,

Ms. Pamela Cooke
271 Vaughn Hill Rd
Bolton, MA 01740
(978) 549-3453
cookejoy@comcast.net

From: Mass Audubon on behalf of sarah Strong
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:43:21 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I was involved in monitoring horseshoe crabs in Pleasant Bay in Chatham. There were significant declines in the population. I also live near the Great Sippewissett Marsh and Woodneck Marsh/Beach in Falmouth during the summer. These areas are critical spawning areas for horseshoe crabs and bird populations. Humans have been selfish in over harvesting simply to harvest whelks that are then sold overseas. Horseshoe crab blood was a key medical advance but scientists have been able to replicate their blood so the horseshoe crab bleeding should be banned. We are destroying what is around us all for the sake of financial gain with disregard for nature that is critical for creature that we share this planet with.
I support this these changes for harvesting regulations.
Sincerely
Sarah Strong
195 Heaths Bridge Rd
Concord MA 01742
sarah.strong@comcast.net

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. sarah Strong
195 Heaths Bridge road
Concord, MA 01742
(617) 974-6686
sarah.strong@comcast.net

From: Mass Audubon on behalf of Theodora Martin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:43:21 PM

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Sincerely,

Ms. Theodora Martin
60 Liberty Ave
Lexington, MA 02420
(781) 354-0225
theomar@verizon.net

From: Mass Audubon on behalf of Marian Scena
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:25:37 PM

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Sincerely,

Dr. Marian Scena
179 Highland Ave.
Somerville, MA 02143
(617) 666-3223
mangua.mrs63@gmail.com

From: Mass Audubon on behalf of Clivia Pasek
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:25:36 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Clivia Pasek
34 Rust Ave
Northampton, MA 01060
(413) 586-1721
clivbeet@gmail.com

From: Mass Audubon on behalf of Peter Jacobson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:25:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Peter Jacobson
334 Central St
East Bridgewater, MA 02333
(508) 208-4702
ejake4@aol.com

From: Mass Audubon on behalf of Lindsay Neubeck-Brooks
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:25:35 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds and need our help, this proposal would be a huge step ensuring their future and the health of our coastal environments.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Lindsay Neubeck-Brooks
52 Troy Lane
Waban, MA 02468
(908) 616-9594
lneubeck@massaudubon.org

From: Mass Audubon on behalf of Mark Hibberd
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:13:20 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Dear Director McKiernan,
Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds including the Red Knot have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds, while I have enjoyed observing them for many years, in Massachusetts and other regions along their epic global migratory journeys. It would be devastating to think that we would not act to maintain the ability of residents of Massachusetts to enjoy these and several other shore bird species.
While the new proposed rule is a step in the right direction and therefore urgently needed as the migration will soon begin again, I urge you to also consider banning their harvest for any purpose until numbers are restored and stable. At such point the active monitoring and management of the horseshoe population might allow limited harvest for legitimate purposes where alternatives are not available. Harvests for biomedical research are no longer valid as synthetic blood products are now widely available.
Many thanks taking the immediate necessary action to protect the horseshoe crab and all those other species that depend upon it, and on behalf of those who love nature and birds.
Mark Hibberd MD PhD

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Mark Hibberd
10 Hudson Rd
Lexington, MA 02421-7839
(781) 307-5225
markghibberd@gmail.com

From: Mass Audubon on behalf of Fiona Land
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 3:13:19 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Watching live horseshoe crabs off the Cape has brought enormous joy to my family. As a veterinarian, I fully understand their role as a key species in both biodiversity and biomedical realms. Humans has benefited enormously from them and we owe them protection

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Fiona Land
14 HARRISON AVE
BEVERLY, MA 01915-3512
(978) 578-7241
fionaland@gmail.com

From: Mass Audubon on behalf of Jacquelyn Pascucci
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 2:43:14 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jacquelyn Pascucci
9 Livingston Rd.
Wellesley, MA 02482
(781) 910-5676
birder002@mac.com

From: Mass Audubon on behalf of Ann Dix
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 2:13:12 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Dear Daniel McKiernan:

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.
lease proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,
Ann Dix
34 Maple Avenue
Cambridge MA 02139
adixanndix@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Ann Dix
34 Maple Avenue
Cambridge, MA 02139
(617) 868-4371
adixanndix@gmail.com

From: Mass Audubon on behalf of Deborah Diemente
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 2:13:12 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Aside from all these great environmental reasons for protecting these creatures, they are truly amazing to see on our state's beaches. For many summers, when my son was young, we spent a week at the Cape and admired and wondered at the many shed shells we found on the sand. They were often incorporated into our sand castles and found art projects. Horseshoe crabs are very old inhabitants of Massachusetts, they deserve protection.
Thank you,
D. Diemente

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Deborah Diemente
18 Francis Avenue
Holyoke, MA 01040-1837
(978) 771-9626
dbdiemente@gmail.com

From: Mass Audubon on behalf of Kenneth Shea
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:55:25 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Kenneth Shea
273 Prospect Street
Franklin, MA 02038
(508) 498-9535
jokenshea42@gmail.com

From: Mass Audubon on behalf of Alexandra Majors
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:55:25 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alexandra Majors
61 Baxter St
Melrose, MA 02176
(774) 999-9999
alexamajors8@gmail.com

From: Mass Audubon on behalf of Rebecca Lee
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:55:24 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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I grew up seeing horseshoe crabs every summer. They are the first wild marine animal I can remember interacting with. I can remember poking the shell and thinking they were almost alien looking. The horseshoe crabs spark my curiosity in nature and I hope that they continue to inspire children in the years to come.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rebecca Lee
86 Brainerd Road, Apt 9
Allston, MA 02134
(917) 691-6040
rebeccajtlee@gmail.com

From: Mass Audubon on behalf of John P. Manning
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:55:24 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. John P. Manning
20 BayPointe Drive Extension
Buzzards Bay, MA 02532
(407) 341-8853
manning.jp@gmail.com

From: Mass Audubon on behalf of Randy-Sue Abber
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:43:12 PM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Randy-Sue Abber
10 Lawndale Ave
Saugus, MA 01906
(781) 231-0877
rabber01@comcast.net

From: Mass Audubon on behalf of Thomas Wallace
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:43:12 PM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Thomas Wallace
4 Center Place, Unit 8
Orleans, MA 02653-3351
(603) 817-1241
twallacenh@gmail.com

From: Mass Audubon on behalf of Jane Shanny
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:43:10 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jane Shanny
275 Prospect Street
Norwell, MA 02061
(781) 659-0126
jshanny09@yahoo.com

From: Mass Audubon on behalf of Ian Briggs
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:43:10 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

The overharvesting of any specie creates negative ripple effects and upsets ecosystem balance. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Sincerely,
Ian Briggs
166 Elm St. #1
N. Cambridge, MA 02140
ibacct7@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ian Briggs
166 Elm St. #1
North Cambridge, MA 02140
(857) 266-9350
ibacct7@gmail.com

From: Mass Audubon on behalf of Erica Curtis
To: Marine Fish (FWE)
Subject: Horseshoe Crab protection
Date: Thursday, February 26, 2026 1:43:10 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Dear Mr. McKiernan,
I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

I often walk the shores of Cape Cod, in all seasons, and see these marvelous and ancient creatures. They are gentle, ancient, and vulnerable members of the Atlantic ecosystem. They deserve protection.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Erica Curtis
65 Central Street
Somerville, MA 02143

(917) 301-6617
ebcurtis@hotmail.com

From: Mass Audubon on behalf of Alex Guernsey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:43:09 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alex Guernsey
854 E Broadway
Boston, MA 02127
(650) 954-0121
alexguernsey7@gmail.com

From: Mass Audubon on behalf of Judith Taylor
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:25:26 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Judith Taylor
47 Lower Dam Way
Dunstable, MA 01827
(978) 273-1636
taylorjudith@yahoo.com

From: Mass Audubon on behalf of John Edmondson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:25:25 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Horseshoe crabs and the eggs they hold are not an infinite resource. The crabs are harvested as if they were plentiful but they just aren't. The shorebirds soming up our coast to the artic have nowhere else to stop for food besides our shores. They have evolved to rely on the Horseshoe crab eggs as a food source. They time their migration to match the availability of the Horseshoe crab eggs. We are responsibile for the damage we do. We must treat the resource as finite and manage it well for the sake of all, birds and people.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. John Edmondson
31 Morton Rd
Arlington, MA 02476
(781) 859-9450
johnhedmondson@gmail.com

From: Mass Audubon on behalf of Phoebe McKinnell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:25:23 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. Given the ecological, cultural, and economic importance of horseshoe crabs, the unnecessary harvest of these animals to be used as bait should be phased out completely. In addition, horseshoe crab eggs are a crucial resource for global migratory birds and rare shorebirds.

I have fond personal memories of encountering these distinctive creatures as a child on the beaches of the North Shore, experiences that opened a door to nature appreciation. It turns out they are a linchpin for biodiverse marine habitats we all rely on.

Yours sincerely,

Phoebe McKinnell
55 Dryads Grn
Northampton MA 01060
pbm18@caa.columbia.edu

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Phoebe McKinnell
55 Dryads Grn
Northampton, MA 01060
(413) 320-6258
pbm18@caa.columbia.edu

From: Mass Audubon on behalf of Erica Ferencik Erica Ferencik
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:25:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Erica Ferencik Erica Ferencik
58 Harrington Rd
Framingham, MA 01701
(508) 284-5254
eferencik101@gmail.com

From: Mass Audubon on behalf of Michael Miller
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:13:04 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

These amazing animals deserve to survive as a species, and the current rate of human killing is far too high to allow that. Especially given the climate-change-fueled transformation happening to waterfront areas - where the horseshoe crabs must come to reproduce - we must act with caution and be especially good stewards. Please vote for good stewardship of these remarkable animals.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Michael Miller
10 Spring Lane
Hopkinton`, MA 01748
(508) 272-2385
nerdcity@comcast.net

From: Mass Audubon on behalf of Francine Traniello
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:55:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Francine Traniello
3808 Pheasant Ln
Middleboro, MA 02346
(508) 947-0423
midnightblue_22@webtv.net

From: Mass Audubon on behalf of MARIA Anthony
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:43:00 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I hope that this proposed measured approach and the reduction of the use of horseshoe crabs for bait will be seen as common-sense preservation tactics. We need to take care of our environment protecting vulnerable populations and striving for a balance in what we take from nature. Horseshoe crabs are a remarkable species, and we need to find ways to keep them on this planet.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. MARIA Anthony
12 Tobin Drive
MAYNARD, MA 01754
(978) 793-2034
mariajranthony@gmail.com

From: Mass Audubon on behalf of Stephen Potter
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:26:04 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Stephen Potter
28 Dorothy Road
Whitman, MA 02382
(617) 710-8806
spotter99@comcast.net

From: Mass Audubon on behalf of Nikki Blades
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:26:03 PM

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Feb 26, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Nikki Blades
46 Nowell Road
Melrose, MA, MA 02176
(781) 720-9801
nikki.blades@hotmail.com

From: Mass Audubon on behalf of Anita Parker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:26:03 PM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Anita Parker
18 Boxwood circle
Yarmouthport, MA 02675
(617) 710-6871
parkeranita4@gmail.com

From: Mass Audubon on behalf of James James
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:13:44 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James James
291 State Highway Rt. 6
Wellfleet, MA 02667, MA 02667
(508) 527-0650
jnielsen@massaudubon.org

From: Mass Audubon on behalf of Sharon Gill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:13:44 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Hello! I live on Pleasant Bay in Orleans, MA, and I am lucky enough to see firsthand how important Horseshoe crabs are. The Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Personally, the number of Horseshoe crabs I see while walking Pleasant Pay seems to be declining - they do not seem to be a numerous as they once were. As a keystone species in our environment, you are also helping so many other species as well. This species has been on the earth for hundreds of millions of years - it's so intertwined with our coastal ecosystem.
Please proceed with adopting these changes in harvesting regulations.
Sincerely, Sharon Gill, Orleans, MA
sgrimmgill@me.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sharon Gill
7 Portside Lane
Orleans, MA 02653
(973) 610-9720
sgrimmgill@me.com

From: Mass Audubon on behalf of Jean Bruns
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:13:43 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jean Bruns
56 Stonecleave Rd
BOXFORD, MA 01921
(978) 852-6748
jeanbbruns@gmail.com

From: Mass Audubon on behalf of Marilynne Roach
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:13:43 PM

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Feb 26, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

These ancient animals fascinated since I first saw them as a child in 1950. Back then older kids, fishing, saw no point in mot wasting them as bait. I hope humans have wised up since then.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Marilynne Roach
141 Marshall St.
Watertown, MA 02472
(617) 924-3559
mkr12y@yahoo.com

From: Mass Audubon on behalf of Marilyn McCrory
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:13:42 PM

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Feb 26, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I regularly travel to Cape Cod and Cape Ann to view migratory shore birds, contributing to our local economy by staying at lodging in these areas and dining out. Preserving these species supports our local economy as well.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Marilyn McCrory
2 Lovett Court
Beverly, MA 01915
(978) 204-9448
marilyn.mccrory@verizon.net

From: Mass Audubon on behalf of Pat Hyde
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:13:42 PM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Pat Hyde
101 Robin Hill Road
Holliston, MA 01746
(508) 259-8734
hyde.pat@gmail.com

From: Mass Audubon on behalf of Mark Nelson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:55:18 AM

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Feb 26, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Mark Nelson
10 Dale Ave Apt 318
Gloucester, MA 01930
(413) 207-1175
nelsomark@duck.com

From: Mass Audubon on behalf of Robert Abraham
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:42:54 AM

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Feb 26, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Robert Abraham
101 Walker St. #B1
Newtonville, MA 02460
(617) 969-1837
howlingman@ymail.com

From: Mass Audubon on behalf of Anna Aguilera
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:42:54 AM

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Feb 26, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

We need to protect nature - because it is the right thing to do, but also to protect ourselves.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Anna Aguilera
12 Glenwood Rd
Needham, MA 02492
(617) 521-2666
aguilera@simmons.edu

From: Mass Audubon on behalf of Ashley Hurst
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:42:54 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ashley Hurst
176 Pine Street
South Weymouth, MA 02190
(617) 838-4647
ashleyciulla@gmail.com

From: Mass Audubon on behalf of Laura Hallowell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:42:53 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I live on the coast. We used to see our shoe crabs, and now they are exceedingly rare.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Laura Hallowell
37 High Street
Rockport, MA 01966
(781) 799-5988
laura.hallowell37@gmail.com

From: Mass Audubon on behalf of Louis Colon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:20 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Louis Colon
20 Shamrock Way
Sterling, MA 01564
(508) 733-1953
loucolon@comcast.net

From: Mass Audubon on behalf of Catherine Carney-Feldman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:15 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Catherine Carney-Feldman
26 Mill Road
Ipswich, MA 01938
(978) 356-7093
carneyfeldman@yahoo.com

From: Mass Audubon on behalf of Eileen McCrory
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:14 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a child in the 1970's I ran around the Cape Cod salt marshes and collected horseshoe crab shells. They're such an interesting creature and so important to the salt marsh ecosystem.

When I ran around the Cape Cod salt marshes with my children I saw the sharp decline of the horseshoe crabs.

When I run around the Cape Cod salt marsh with my grandson the horseshoe crab shells are very rare.

The bait and biomedical harvests have devistated the horseshoe crab population on Cape Cod and it has ramifications across the entire salt marsh ecosystem. We need to protect these creatures.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Eileen McCrory
216 Concord Road
Lincoln, MA 01773
(617) 797-8391
eileen.mccrory@gmail.com

From: Mass Audubon on behalf of Stewart Pattison
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:14 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Every species is a link in a web of relationships which make our world. We need to take care of each in order to preserve the whole. Horseshoe crabs connect us with the very earliest days of life and thus deserved to be respected as the elders they are.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Stewart Pattison
29 Ryder Pond West Rd
CHATHAM, MA 02633
(518) 956-0950
stewartepattison@gmail.com

From: Mass Audubon on behalf of Rebecca Rottapel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:14 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rebecca Rottapel
54 Southbourne Rd
Jamaica Plain, MA 02130
(437) 324-8429
rebecca.rottapel@gmail.com

From: Mass Audubon on behalf of Susan Cornelia
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:13 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Cornelia
25 Ari's Way
Milford, MA 01757
(508) 473-1481
monita6870@gmail.com

From: Mass Audubon on behalf of Erika Pfammatter
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:13 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I care very deeply about preserving our natural resources and fragile environment. Horseshoe crabs are extraordinary creatures in and of themselves, well worthy of our admiration protection. Their importance in the ecological food chain cannot be underestimated, and - given the already intense stresses on their population - their use by humans should be limited to cancer research on their blood. To use them as bait is antiquated and ridiculous, when there are multiple equivalent - or superior! - choices.
I strongly urge you to support the DMF's proposal.
Thank you in advance for your careful consideration.
- Erika Pfammatter
210 Blue Heron Road
Wellfleet MA
eripfa13@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Erika Pfammatter

210 Blue Heron Road
Wellfleet, MA 02667
(508) 214-0889
eripfa13@gmail.com

From: Mass Audubon on behalf of Dawn LaFontaine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:13 AM

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Dawn LaFontaine
9 Oak Ridge Lane
Ashland, MA 01721
(508) 881-7655
dawnlafontaine@yahoo.com

From: Mass Audubon on behalf of Caroline Gallagher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:25:12 AM

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Caroline Gallagher
17 Park Street
Pepperell, MA 01463
(617) 504-4920
cgallaher@hotmail.com

From: Mass Audubon on behalf of Catherine Hoffman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:12:53 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

A frequent visitor to Massachusetts and New England beaches, I always enjoy seeing horseshoe crabs, so this issue is personally important to me. In addition, horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Catherine Hoffman
16 Hutchinson Road
Arlington, MA 02474
(781) 859-9246
catherinewhoffman@hotmail.com

From: Mass Audubon on behalf of Catherine Luce
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:12:51 AM

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Feb 26, 2026

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Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a bird watcher and wildlife photographer I wish you to please consider approving DMF's horseshoe crab proposal.

"Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds."

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Catherine Luce
135 EAST ST
Wrentham, MA 02093
(508) 813-5967
catherineluce135@gmail.com

From: Mass Audubon on behalf of Austin Brayton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:12:51 AM

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I love the ocean and love seeing horseshoe crabs at the beach. As a former employee of the New England Aquarium, where I worked with shorebirds, I know the importance of horseshoe crabs in providing food for migratory birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Austin Brayton
12 Adelaide St
Boston, MA 02130-2130
(617) 459-7686
aubrayton@gmail.com

From: Mass Audubon on behalf of Liam Sullivan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 11:12:51 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Liam Sullivan
59 Fulda Street
Roxbury, MA 02119
(617) 276-2463
liamothemts@gmail.com

From: Mass Audubon on behalf of Alicia Kleppinger
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:16 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alicia Kleppinger
57 Meetinghouse Lane
Boxborough, MA 01719
(267) 994-2060
akleppinger@gmail.com

From: Mass Audubon on behalf of Suzanne Stewart
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:14 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

So I agree with the proposal to limit the crabs from fishermen's bait. However, the biomedical community should not be allowed to harvest them either. It has been proven that the crabs do not survive well after "bleeding" , nor do they reproduce well, so basically they are useless after the 'bleeding" even though they are released back into the wild.

Both the fishermen and the bio labs use must stop.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Suzanne Stewart
207 Viking Drive
Plymouth, MA 02360
(610) 555-1234
suzstewart1@gmnail.com

From: Mass Audubon on behalf of KAREN CHRISTIE
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:13 AM

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Fact: Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. KAREN CHRISTIE
22 CASTLE HILL AVE
GREAT BARRINGTON, MA 01230
(615) 282-1949
karengracechristie@gmail.com

From: Mass Audubon on behalf of Devon Beckett
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:13 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Devon Beckett
45 Brigham St
Watertown, MA 02472
(617) 393-0206
dbates22@hotmail.com

From: Mass Audubon on behalf of Nancy McArdle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:13 AM

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Sincerely,

Ms. Nancy McArdle
31 Midgley Ln
Worcester, MA 01604
(508) 797-3944
mcardlen@charter.net

From: Mass Audubon on behalf of Fanny Whitman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:12 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Fanny Whitman
1346 Main Road
Westport, MA 02791
(774) 264-9065
fannynlwhitman@gmail.com

From: Mass Audubon on behalf of Elizabeth Lehman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:12 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Lehman
132 Dartmouth Street
Holyoke, MA 01040
(413) 533-4242
eblehman5@gmail.com

From: Mass Audubon on behalf of Neil Immerman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:55:12 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Harvesting horseshoe crabs for bait is unreasonable and short sighted.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Neil Immerman
37 Hillcrest Place
AMHERST, MA 01002
(413) 282-8275
neil.immerman@gmail.com

From: Mass Audubon on behalf of Nicole VanderLaan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:42:52 AM

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Feb 26, 2026

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As someone who studied and worked with horseshoe crabs during undergrad, I both understand their unique qualities both as a fascinating animal and the research contributions for their blood. While there is a 100% mortality for bait, obviously, it is somewhat understood that it is very likely the mortality is much higher than the direct 15% in lab once they are returned to the ocean. More research (on them, not with them!) needs to be done before anything is further refined but this would be a good start. With bait catches are often underreported and this acting as more of a deterrent, and hopefully overall blood collection REAL mortally rates being 50%, this would still be essentially at least a break even number for now, and start wheels turning for more sustainable and hopefully ethical processes for biomedical research going forward.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Nicole VanderLaan
71 Fox Road
Waltham, MA 02451
(774) 276-1843
nashmankas@gmail.com

From: Mass Audubon on behalf of Philip Koch
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:42:50 AM

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Philip Koch
1080 over or fence RD
Eastham, MA 02642
(847) 971-8077
skipk37@aol.com

From: Mass Audubon on behalf of James Mavor
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:42:50 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James Mavor
33 Gilbert Rd
Needham, MA 02492
(617) 549-2043
jim.mavor@yahoo.com

From: Mass Audubon on behalf of A McCall
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:42:49 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There is more need to support the population of horseshoe crabs than a need for bait fish! Please help protect them as much as you can. Thank you for helping!!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. A McCall
88A Walker Rd.
Shirley, MA 01464-2900
(978) 425-6132
dawnmccall10@gmail.com

From: Mass Audubon on behalf of Sherri Schon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:42:49 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sherri Schon
584 Kinnebrook Rd
Worthington, MA 01098-9578
(860) 841-7600
sherri.schon@gmail.com

From: Mass Audubon on behalf of Annie Dobroth
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:25:13 AM

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Feb 26, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are not only incredibly interesting and unique animals in themselves, but are also very important to human lives. If you value western medicine, you should want to preserve horseshoe crabs because they are vital for sterilizing equipment to this day. A vote for this legislation is a vote to preserve human lives.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Annie Dobroth
26 Francis st
Brookline, MA 02446
(617) 739-7410
avis138@gmail.com

From: Mass Audubon on behalf of Lisa Manzî
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:25:11 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and an important part of a healthy marine ecosystem.

There are other important steps that could be taken such as how the medical industry handles the horseshoe crabs during and after their use for medical purposes that would enhance survival rates, but this proposal would be a positive step forwards.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Lisa Manzî
185 Linebrook Road
Ipswich, MA 01938
(978) 500-4568
lisasmanzi50@gmail.com

From: Mass Audubon on behalf of Barbara Howell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:25:11 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Long-distance migrants such as the Red Knot have adapted to feed on the eggs of the horseshoe crabs on their long migration route.
Follow the steps other States are taking and stpo harvesting Horseshoe Crabs.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Barbara Howell
12 Orchard Lane
Wayland, MA 01778-1908
(508) 358-4508
bhowell12@verizon.net

From: Mass Audubon on behalf of Cynthia Wigren
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:25:11 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Cynthia Wigren
199 Timberlane Drive
Brewster, MA 02631
(603) 498-3424
cynthiawigren@yahoo.com

From: Mass Audubon on behalf of Catherine Fedorsky
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 10:12:46 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Do your best to reconsider your options. Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Catherine Fedorsky
10 Rockwood Lane
Gloucester, MA 01930-1029
(978) 491-0171
fedorsky@gmail.com

From: Mass Audubon on behalf of Rita Rooney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:55:10 AM

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Feb 26, 2026

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Dear Marine Fisheries Advisory Council,

I am writing to ask you to please adopt DMF's changes to protect Horseshoe Crabs. These changes are important.

When I was growing up in Quincy, MA I used to see so many horseshoe crabs on Wollaston Beach. I have fond memories of picking up their tails to turn the over so they could go out with the tide. I see them no longer and, for many years now, they have been absent. It is sad they are no longer as strong and vibrant as they were. As you likely know, when one species fails, others do.

Please do what you can to protect them. Thank you.

Sincerely,
Rita Rooney
16 Trafalgar St
Brockton, MA 02301
reerooney41@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rita Rooney
16 Trafalgar Street
Brockton, MA 02301
(508) 857-9883
reerooney41@gmail.com

From: Mass Audubon on behalf of Vi Patek
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:55:09 AM

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Feb 26, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Vi Patek
172 Willow Rd
Nahant, MA 01908-1433
(781) 598-1060
vipatek@gmail.com

From: Mass Audubon on behalf of H Long
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:55:09 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. H Long
7 Revere St
Jamaica Plain, MA 02130
(617) 855-7350
hlongsinnott@hotmail.com

From: Mass Audubon on behalf of Margaret Cain
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:55:09 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Margaret Cain
1550 Beacon Street
Brookline, MA 02446
(617) 359-5349
margaretjcain@verizon.net

From: Mass Audubon on behalf of Mary Jane Donovan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:42:45 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Jane Donovan
7 Wilbur St
Malden, MA 02148-1725
(781) 397-9646
donmjoli@yahoo.com

From: Mass Audubon on behalf of CHERYL SHUTT
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:42:44 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. When I moved here from Michigan 60 years ago, I had never seen or heard of horseshoe crabs. I have been fascinated with them ever since that first encounter. I was heartbroken to learn that they are blead to do lab tests and used for bait. In this day and age when we have so many medical advances, can't we make an alternative? And can't the fisherman use some other type of bait? These poor crabs are so slow that anyone can grab them, and they really have no defense against us. Please save their species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. CHERYL SHUTT
173 Beechwood Road
Hanson, MA 02341
(781) 588-1617
cherieshutt@comcast.net

From: Mass Audubon on behalf of Sean Rigney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:42:43 AM

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Feb 26, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
During a time when the federal government is weakening acts like the Endangered Species Act, it comes down to the states to protect our natural resources. Horseshoe crabs are ancient creatures that have existed long before us, and they deserve to be able to exist. Species are especially threatened now due to climate change and human actions, anything we can do to ease the pressures on threatened species will be beneficial. Massachusetts is often the leader of science-driven policy and leads other states to follow suit. I urge you to adopt this lowered annual quota and set a standard for other states to follow.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Sean Rigney
45 Grandview Ave
Quincy, MA 02170
(203) 843-3844
sprigney.97@gmail.com

From: Mass Audubon on behalf of Colleen Wade
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:42:43 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Colleen Wade
1779 West Street
Mansfield, MA 02048
(508) 802-2029
hautebiker@aol.com

From: Mass Audubon on behalf of Cynthia Sauer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:42:43 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Cynthia Sauer
754 Lindsey Steet
Attleboro, MA 02703
(774) 254-3211
cynthia.sauer@icloud.com

From: Mass Audubon on behalf of Barbara Lynn-Davis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:25:11 AM

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Feb 26, 2026

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Sincerely,

Dr. Barbara Lynn-Davis
21 Davis Court
Concord, MA 01742
(978) 341-0909
barbara.lynndavis21@gmail.com

From: Mass Audubon on behalf of Karen kaiser
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:25:07 AM

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Feb 26, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I participate in counting horseshoe crabs during spawning season in the Nauset Estuary on Cape Cod. Our estuaries are fragile and protecting key components - like horseshoe crabs - are critical to their survival.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Karen kaiser
301 Tonset Road
Orleans, MA 02653
(615) 598-1502
karenskaiser13@gmail.com

From: Mass Audubon on behalf of Mary Dunn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:25:07 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Dunn
50 Hillside Dr
Hanover, MA 02339
(781) 826-5315
meugdunn@gmail.com

From: Mass Audubon on behalf of Maribeth Crane
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:25:06 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maribeth Crane
30 E Concord St
Boston, MA 02118
(781) 325-6280
maryelizabeth.crane@gmail.com

From: Mass Audubon on behalf of Nathaly Herrel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:43 AM

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Feb 26, 2026

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Dear Director McKiernan,

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I am 52 and still get such a thrill when I see a horseshoe crab when walking along a seashore. Simply put, it is an extraordinary creature. It is odd, beautiful, ancient, and although it looks somewhat ominous, it is harmless to humans. I first saw a horseshoe crab as a child and want to be sure that future generations can continue to experience and enjoy seeing these animals up close.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Nathaly Herrel
3 Pine Ridge Rd
Arlington, MA 02476
(301) 337-5248
n_herrel@hotmail.com

From: Mass Audubon on behalf of Charles Deknatel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:41 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Charles Deknatel
2 Alveston Terrace
Jamaica Plain, MA 02130
(617) 637-1136
cdeknatel@comcast.net

From: Mass Audubon on behalf of Alexis Khalil
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:41 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alexis Khalil
60 Russell Avenue
Watertown, MA 02472
(617) 899-1053
alexis.khalil@gmail.com

From: Mass Audubon on behalf of Jeff Bryant
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:40 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

During last year's spring International Shorebird Survey, I watched several species of shorebirds, in brilliant breeding plumage, feeding on horseshoe crab eggs, as they were being laid. It reminded me how important it is to preserve these species to engage in their ages-old behaviors. I hope you will likewise make such preservation a regulatory priority.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jeff Bryant
1232 Route 134
South Dennis, MA 02660
(508) 737-1593
five_loons@yahoo.com

From: Mass Audubon on behalf of DEBORAH MASSA
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:39 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. DEBORAH MASSA
34C Essex Green Lane
Peabody, MA 01960
(123) 456-7890
redhouse.1859@gmail.com

From: Mass Audubon on behalf of Edward M Ryerson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:39 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Edward M Ryerson
12 Upton St.
Cambridge, MA 02139
(617) 491-8436
mryersondesign@gmail.com

From: Mass Audubon on behalf of Kenneth Dews
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 9:12:39 AM

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It is time to end the practice of harvesting Horseshoe crabs for bait . These crabs are much more valuable as a food source for birds who rely on their eggs to survive. Horseshoe Crabs are one of the most unique and ancient animals in Massachusetts and I want them to continue to thrive forever.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Kenneth Dews
4 Melody Ln
Chelmsford, MA 01824
(508) 451-0371
krendews@gmail.com

From: Mass Audubon on behalf of Heiko Runz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:55:10 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Heiko Runz
6 Middle St
Beverly, MA 01915
(978) 998-1240
heiko.runz@gmail.com

From: Mass Audubon on behalf of Tiffaney Ross
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:55:10 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Tiffaney Ross
153 Perkins Row
Topsfield, MA 01983
(206) 501-0524
tsross80@gmail.com

From: Mass Audubon on behalf of Betsy Goldman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:55:08 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Betsy Goldman
64 Marion Road
Watertown, MA 02472
(617) 852-2162
betsysgoldman@gmail.com

From: Mass Audubon on behalf of Lindi Higgins
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:55:07 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Lindi Higgins
154 Old Valley Rd
Brewster, MA 02631-2044
(603) 769-1906
lindi.higgins154@gmail.com

From: Mass Audubon on behalf of Glenna Waterman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:55:07 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please leave horseshoe crabs alone! Stop any harvesting of horseshoe crabs!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Glenna Waterman
134 Argilla Road
Ipswich, MA 01938
(617) 872-4438
amiezuni7@gmail.com

From: Mass Audubon on behalf of Karyl Stoia
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:40 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Karyl Stoia
30 Forest St
Lynn, MA 01905
(781) 595-5612
jowodin@aol.com

From: Mass Audubon on behalf of Ann M Gantz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:40 AM

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Sincerely,

Ms. Ann M Gantz
47 Pemberton Street, #3
Cambridge, MA 02140
(617) 547-1474
annmgantz@gmail.com

From: Mass Audubon on behalf of Ruth Fundyga
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:39 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ruth Fundyga
37 Alden St
Plymouth, MA 02360
(706) 254-0291
fundyga@gmail.com

From: Mass Audubon on behalf of Richard Brown
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:38 AM

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Feb 26, 2026

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Please protect this ancient species. They are an integral link in the web. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Thank you in advance for your help.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Richard Brown
378 Still River Road
Bolton, MA 01740
(978) 870-8153
rick.brown.jr143@gmail.com

From: Mass Audubon on behalf of Justin Anderson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:38 AM

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Feb 26, 2026

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Sincerely,

Mr. Justin Anderson
822 Nantasket Ave, Apt 3
Hull, MA 02045
(774) 208-2553
justin.erik.anderson@gmail.com

From: Mass Audubon on behalf of Rebecca Zumbruski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:38 AM

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Sincerely,

Ms. Rebecca Zumbruski
4 Carol Ave
Easthampton, MA 01027
(413) 209-1026
rzumbruski@massmutual.com

From: Mass Audubon on behalf of Ann Suazo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:42:38 AM

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Sincerely,

Mrs. Ann Suazo
36 Milford St
Upton, MA 01568
(508) 529-3075
suazoupton@aol.com

From: Mass Audubon on behalf of Geoffrey Rich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:09 AM

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Sincerely,

Mr. Geoffrey Rich
55 Highland St
Webster, MA 01570
(508) 555-1616
geoffreyrich@hotmail.com

From: Mass Audubon on behalf of Diana Fruguglietti
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:08 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Diana Fruguglietti
5 Ellen Rd
Woburn, MA 01801
(781) 354-7716
diana.fru@gmail.com

From: Mass Audubon on behalf of Ellen Brezniak
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:07 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ellen Brezniak
185 W Main Street
Westborough, MA 01581
(508) 366-9284
ellenbrezniak@yahoo.com

From: Mass Audubon on behalf of Sarah Kuhn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:07 AM

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Feb 26, 2026

Director Daniel McKiernan

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sarah Kuhn
155 Argilla road
Ipswich, MA 01938
(978) 380-0926
sally-ku@comcast.net

From: Mass Audubon on behalf of Todd Miller
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:07 AM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Todd Miller
2 Robert Rd
Milford, MA 01757
(774) 462-2611
toddwmiller@hotmail.com

From: Mass Audubon on behalf of Michael Monn
To: Marine Fish (FWE)
Subject: Save the horseshoe crabs!
Date: Thursday, February 26, 2026 8:25:06 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I remember walking the coast as a kid with my dad being absolutely fascinated by horseshoe crabs. They played an important role in insuring me to study marine invertebrates for my PhD. These animals are not only an important part of our ecosystem but also for sparking curiosity in kids like me.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Michael Monn
305 elm st apt 2
Cambridge, MA 02139
(518) 744-3105
michael_monn@alumni.brown.edu

From: Mass Audubon on behalf of Tara Mahoney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:05 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Tara Mahoney
54 Palfrey Street
East Watertown, MA 02472
(845) 826-1231
tara.mahoney@gmail.com

From: Mass Audubon on behalf of Maureen Black
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:25:05 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Maureen Black5 Old State RoadErving MA 01344

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maureen Black
5 Old State Road
Erving, MA 01344
(413) 230-5716
rinkyblack1@gmail.com

From: Mass Audubon on behalf of Kristina Geller
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:38 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please adopt this bill !!!
Thank you.
Kristina Geller
20 union Square
Randolph MA 02368
K.geller50@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kristina Geller
20 Union Square
Randolph, MA 02368
(781) 308-4118
k.geller50@gmail.com

From: Mass Audubon on behalf of Kevin Dunleavy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:38 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Kevin Dunleavy
112 Old Wharf Road E-14
Dennis Port, MA 02639
(203) 417-0447
kmdunleavy54@gmail.com

From: Mass Audubon on behalf of Libby Haycock
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:38 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Libby Haycock
2 Nashua St
Shirley, MA 01464
(555) 555-5555
ljohay@comcast.net

From: Mass Audubon on behalf of Jane Truesdell Ellis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:36 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jane Truesdell Ellis
650 Lowell St
Lynnfield, MA 01940
(781) 820-7870
jteesq@aol.com

From: Mass Audubon on behalf of Thomas C. Webster III
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:36 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Thomas C. Webster III
34 Oakdale Avenue
Marion, MA 02738
(781) 724-4352
webstertiii@yahoo.com

From: Mass Audubon on behalf of Kelly Conger
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:36 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kelly Conger
9 bailey st
FOXBORO, MA 02035
(774) 251-8516
congerkelly@hotmail.com

From: Mass Audubon on behalf of Margaret Merzbacher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:36 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
They are incredible creatures and deserve to be protected.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Margaret Merzbacher
91 Gibson Rd
Orleans, MA 02653-2509
(781) 248-5648
pmerzbacher@gmail.com

From: Mass Audubon on behalf of Jeff Childs
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:36 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jeff Childs
9 Rolling Lane
Sudbury, MA 01776
(610) 217-9756
jeffreydchilds@gmail.com

From: Mass Audubon on behalf of Donald Wilhelm
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:35 AM

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Please save horseshoe crabs. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Donald Wilhelm
1120 Beacon St.
Brookline, MA 02446
(857) 707-6309
dwilhelm112@comcast.net

From: Mass Audubon on behalf of Elizabeth Thibeault
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 8:12:35 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Thibeault
666 Main St Apt 207
Winchester, MA 01890-1955
(978) 369-8255
thibeault_liz@comcast.net

From: Mass Audubon on behalf of David Caruso
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:55:06 AM

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Feb 26, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Caruso
5 Grasshopper Lane
Scituate, MA 02066-1616
(617) 306-1175
dj.caruso@comcast.net

From: Mass Audubon on behalf of Michael McCarthy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:55:05 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

We deserve to know that our children will see as many horseshoe crabs and shorebirds at the beach as we have. Don't allow a few people to ruin our seashore ecology for money.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Michael McCarthy
76 LYALL STREET
WEST ROXBURY, MA 02132-1743
(781) 410-7090
mmccarthy15@verizon.net

From: Mass Audubon on behalf of Laura Bibbo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:55:05 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Laura Bibbo
40 Old Mill Road
Maynard, MA 01754
(781) 363-2121
lauraoffices15@gmail.com

From: Mass Audubon on behalf of Susan Holland
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:55:04 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Holland
51 Hop Brook Rd.
Amherst, MA 01002
(413) 404-3956
sholland0206@gmail.com

From: Mass Audubon on behalf of Katherine Russell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:55:04 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Katherine Russell
35 Autumn Ln
Amherst, MA 01002
(508) 280-2260
kravacadotree17@gmail.com

From: Mass Audubon on behalf of Carol Farricker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:55:04 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
These creatures are some of the oldest living things on earth today. We need to protect them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carol Farricker
45 Griffin Rd
Framingham, MA 01701
(774) 272-1006
carolfarricker@gmail.com

From: Mass Audubon on behalf of Michele Ellicks
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:37 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Michele Ellicks
452 Main Street
Acton, MA 01720
(978) 502-0921
mellicks@verizon.net

From: Mass Audubon on behalf of Elaine Dionne
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:36 AM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Elaine Dionne
134 Dutcher St.
Hopedale, MA 01747
(508) 634-0536
elainedionne@comcast.net

From: Mass Audubon on behalf of Laurel Facey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:35 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Laurel Facey
47 Davis Rd
Millers Falls, MA 01349-1313
(978) 544-7178
lfacey88@crocker.com

From: Mass Audubon on behalf of Patricia Handy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:35 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Patricia Handy
116 Oakmont Road
YarmouthPort, MA 02675
(978) 790-3000
p.rhandy@aol.com

From: Mass Audubon on behalf of Corey Smigliani
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:35 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Our ecosystem is fragile as it is!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Corey Smigliani
175 Front Street
Weymouth, MA 02188
(627) 439-2383
c.smigliani@gmail.com

From: Mass Audubon on behalf of Arlene Levin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:33 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Arlene Levin
300 Mary Chase Road
Eas, MA 02465
(617) 777-2637
arlene.levin@erg.com

From: Mass Audubon on behalf of Patricia Tholl
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:33 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Patricia Tholl
140 Warren St.
Needham, MA 02492
(781) 449-1086
patriciatholl@hotmail.com

From: Mass Audubon on behalf of Melissa Person
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:33 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Protecting horseshoe crabs helps preserve more than horseshoe crabs.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Melissa Person
63 Andover Rd
Billerica, MA 01821
(528) 348-9640
mper38@comcast.net

From: Mass Audubon on behalf of George Forte
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:32 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. George Forte
54 Hamilton Avenue
Orange, MA 01364
(508) 930-6747
fred87b@yahoo.com

From: Mass Audubon on behalf of John Handy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:42:32 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. John Handy
116 Oakmont Road
YarmouthPort, MA 02675
(978) 502-4047
jeb.handy@highlinerfoods.com

From: Mass Audubon on behalf of RAYMOND HARPIN
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:25:03 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. RAYMOND HARPIN
35 ANCHORAGE RD
FRANKLIN, MA 02038
(508) 520-1597
rjharpin@verizon.net

From: Mass Audubon on behalf of Elizabeth McCollum
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:25:03 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth McCollum
6 Lantern Lane
Shrewsbury, MA 01545
(508) 868-8871
bmccollum@townisp.com

From: Mass Audubon on behalf of Cheryl Gruenstern
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:25:01 AM

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Feb 26, 2026

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Sincerely,

Ms. Cheryl Gruenstern
P.O. Box 339
Centerville, MA 02632
(508) 314-1581
greenies@live.com

From: Mass Audubon on behalf of Jennifer Querbes
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:12:33 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jennifer Querbes
41 Cushing Rd
Westwood, MA 02090
(413) 297-5703
jlh137@proton.me

From: Mass Audubon on behalf of Erin Hart
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 7:12:33 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Erin Hart
469 East St
Carlisle, MA 01741
(781) 325-5635
ehart012@gmail.com

From: Mass Audubon on behalf of Lydia Roberts
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:55:00 AM

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Feb 26, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lydia Roberts
105 Greene St
Hopedale, MA 01747
(508) 655-9026
medusachic666@gmail.com

From: Mass Audubon on behalf of Rhonda Lyons
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:54:59 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rhonda Lyons
11 Winifred Road
Framingham, MA 01701
(508) 380-1573
rab426@msn.com

From: Mass Audubon on behalf of Sylvia Fine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:54:59 AM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Sylvia Fine
6 Avon Pl
Cambridge, MA 02140
(617) 547-5437
sylvia.fine@gmail.com

From: Mass Audubon on behalf of Lauren Wilson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:54:59 AM

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Feb 26, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds, and are such a vital part of our state's natural beauty and biodiversity.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lauren Wilson
66 Chandler Rd.
Medford, MA 02155
(617) 953-6287
lewmedford@gmail.com

From: Mass Audubon on behalf of Kim Deandrade
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:54:58 AM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kim Deandrade
54 Canal St
Medford, MA 02155-3642
(781) 488-0932
kimdea@earthlink.net

From: Mass Audubon on behalf of Anita Wolovick
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:54:58 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

This is a golden opportunity to do the right thing for the preservation of this remarkable creature.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Anita Wolovick
7 Hillside Ct.
Gloucester, MA 01930
(978) 325-6992
wolly01930@gmail.com

From: Mass Audubon on behalf of Trevor Pontbriand
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:54:57 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Trevor Pontbriand
110 Holbrook Ave
Wellfleet, MA 02667
(508) 349-2134
pontbriand@gmail.com

From: Mass Audubon on behalf of Wendy LaPine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:42:34 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Wendy LaPine
91 Deacon Court
Barnstable, MA 02630
(508) 776-5003
wslapine@yahoo.com

From: Mass Audubon on behalf of Laura Sanford
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:42:34 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Laura Sanford
49 Milford St.
Boston, MA 02118
(617) 620-8716
sanfo235@aol.com

From: Mass Audubon on behalf of Peter Olsen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:42:31 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Peter Olsen
89 south street Unit 304
Pittsfield, MA 01201
(830) 822-4802
2431ginger@gmail.com

From: Mass Audubon on behalf of Melissa Bird
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:42:31 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs and their eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Melissa Bird
111 Depot Road
Harwich, MA 02645
(774) 237-0881
nursebird@gmail.com

From: Mass Audubon on behalf of James Goodrich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:42:31 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I lived 12 years on Cape Cod, and served 3 years on the Town of Brewster Coastal Committee. In that time frame I saw the population of these crabs decrease dramatically.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

The use of this resource as bait is a relic, not a necessity, please alter the quotas.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James Goodrich
87 Chester Rd
Blandford, MA 01008
(970) 596-8352
jrgoodrich66@gmail.com

From: Mass Audubon on behalf of Gemma Martin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:24:54 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Horseshoe crabs are an iconic symbol of cape cod and MA. They need our protection.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Gemma Martin
202 Bonham Rd
Dedham, MA 02026
(781) 608-2735
gwardmartin65@gmail.com

From: Mass Audubon on behalf of McNamara Buck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:12:32 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. McNamara Buck
18 Gold Star Road
Cambridge, MA 02140
(617) 833-2766
buck.rome@comcast.net

From: Mass Audubon on behalf of Nicole Hart
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:12:31 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Nicole Hart
39 Highland St
Dedham, MA 02026-5801
(617) 595-6748
nprowell@gmail.com

From: Mass Audubon on behalf of Clara Venditto
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:12:30 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Clara Venditto
62 Fenway Lane
Hanscom Airforce Base, MA 01731
(000) 000-0000
clara.venditto@outlook.com

From: Mass Audubon on behalf of David Sutherland
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 6:12:30 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Sutherland
114 Stonebridge Dr.
Dracut, MA 01826
(978) 987-7857
sutherland.david@comcast.net

From: Mass Audubon on behalf of Ann Nelson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:54:56 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Thank you so much for all that the division is doing to help protect the earth's ecosystem.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ann Nelson
31 Weymouth St.
Quincy, MA 02169
(617) 475-0828
nelson011108@outlook.com

From: Mass Audubon on behalf of Julia Maynard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:42:28 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Julia Maynard
5 Valley Road
Whitman, MA 02382
(617) 340-3303
jsuemaynard@gmail.com

From: Mass Audubon on behalf of Lisa Gorman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:24:50 AM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Lisa Gorman
48 Ledgewood Road
Weston, MA 02493
(978) 807-7008
ldg.dvm@gmail.com

From: Mass Audubon on behalf of Loree Lane
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 5:12:28 AM

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Feb 26, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

We have to stop destroying animals in nature for 'tradition' or unnecessary practices.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Loree Lane
40 Doty Dr
Stoughton, MA 02072
(339) 206-7259
rav74@hotmail.com

From: Mass Audubon on behalf of Susi Westwood
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:54:49 AM

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Feb 26, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susi Westwood
161 west street
plainfield, MA 01070
(413) 329-3811
susituson@rcn.com

From: Mass Audubon on behalf of pranab Banerjee
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 4:42:24 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. pranab Banerjee
10 Hawley St
Northampton, MA 01060
(626) 817-2331
dnpsoft@hotmail.com

From: Mass Audubon on behalf of D"Anna Fortunato
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 2:24:45 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. D'Anna Fortunato
10 Neillian Cres
Jamaica Plain, MA 02130-2417
(617) 522-6036
dannateach@aol.com

From: Mass Audubon on behalf of John Re
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 2:24:42 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. John Re
655 Blandford Rd.
Granville, MA 01034
(413) 357-8836
jlre@comcast.net

From: Mass Audubon on behalf of Sherry Weiland
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 2:24:42 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sherry Weiland
144 brook st
Hudson, MA 01749
(978) 579-0564
sherrylw9@verizon.net

From: Mass Audubon on behalf of Jessica Tsoukalas
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 1:42:08 AM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Jessica Tsoukalas
1157 Main St
Brewster, MA 02631
(774) 652-8859
cauliflower71@hotmail.com

From: Mass Audubon on behalf of Alice Johnson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:24:35 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Alice Johnson
47 Hillsde Road
Watertown, MA 02472
(617) 923-9068
aliceljohnson@mac.com

From: Mass Audubon on behalf of Joan M. Angelosanto
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 26, 2026 12:11:56 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Joan M. Angelosanto
240 W EMERSON ST
Melrose, MA 02176
(781) 665-2469
joaniea0319@gmail.com

From: Mass Audubon on behalf of Sarah Gulla
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 11:54:33 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah Gulla
36 Spring Street
Leicester, MA 01524
(508) 864-0038
scmp.gulla@gmail.com

From: Mass Audubon on behalf of Rikki Tracy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 11:41:54 PM

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Feb 25, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rikki Tracy
37 Upland Rd
Malden, MA 02148
(802) 522-0700
rikkitracy@gmail.com

From: Mass Audubon on behalf of Joshua Polly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 11:41:54 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Joshua Polly
25 WHEATLAND ST # 1
Somerville, MA 02145-2013
(617) 794-5192
djjoed@gmail.com

From: Mass Audubon on behalf of Patricia Donahue
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 11:24:40 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Patricia Donahue
30 Whaler Lane
Quincy, MA 02171
(617) 479-8625
donahuep@msn.com

From: Mass Audubon on behalf of Matthew Luz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 11:11:51 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Matthew Luz
6 Shady Osk Lane
Natick, MA 01760
(978) 836-9762
pestluz@msn.co

From: Mass Audubon on behalf of Luis Quintanilla
To: Marine Fish (FWE)
Subject: Support Stronger Horseshoe Crab Protections
Date: Wednesday, February 25, 2026 11:11:48 PM

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Feb 25, 2026

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Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Luis Quintanilla
410 Salem St. #201
Wakefield, MA 01880
(857) 316-9645
luis.quintanilla@gmail.com

From: Mass Audubon on behalf of Kenneth Lederman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:54:30 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Kenneth Lederman
94 s ashfield road
Williamsburg, MA 01096
(703) 379-0118
kenled2@yahoo.com

From: Mass Audubon on behalf of Ryan Grieco
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:47 PM

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Feb 25, 2026

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I think it's important to acknowledge that this is an animal that has been coming to beaches around the world for 250 million years. That is truly impossible to comprehend. This past summer I spent a good amount of time just watching these wonderful creatures more around and attempt to mate in the beaches around Eastham, MA. It was truly magical to witness. There is no value that can be placed on sharing the world with an abundant diversity of creatures, many of which have been around far, far longer than us humans. Please protect horseshoe crabs for current and future generations.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ryan Grieco
290 Goody Hallet Dr
Eastham, MA 02642-2682
(508) 922-1282
ryangrieco1@gmail.com

From: Mass Audubon on behalf of Maureen O"Dowd
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:46 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Maureen O'Dowd
327 Howe St.
Methuen, MA 01844
(978) 685-9870
dkmod@comcast.net

From: Mass Audubon on behalf of Margaret Rydant
To: Marine Fish (FWE)
Subject: Concerning DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:46 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Margaret Rydant
335 Church St
Northborough, MA 01532
(508) 393-8362
pegrydant@yahoo.com

From: Mass Audubon on behalf of Judy Gibian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:46 PM

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Sincerely,

Ms. Judy Gibian
384 Hemenway Street
Marlborough, MA 01752
(617) 275-1091
jgibian484@gmail.com

From: Mass Audubon on behalf of Kara Buckley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:45 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kara Buckley
171 Sycamore Street
Roslindale, MA 02131
(978) 621-7621
karamariebuckley@gmail.com

From: Mass Audubon on behalf of Peter Sadlier
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:45 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Peter Sadlier
204 Springs Road
Bedford, MA 01730
(978) 973-1985
psadlierbosox@yahoo.com

From: Mass Audubon on behalf of jacqueline Martin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:45 PM

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Sincerely,
Jacqueline Martin
21 Curve St
Sherborn, MA, 01770
jackiemartin@mac.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. jacqueline Martin
21 Curve St

Sherborn, MA 01770
(339) 927-3274
jackiemartin@mac.com

From: Mass Audubon on behalf of Kathleen LeBlanc
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:41:44 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kathleen LeBlanc
42 polaski ave
Chicopee, MA 01013
(413) 210-3105
catsdeflepligrl@gmail.com

From: Mass Audubon on behalf of James Hadcroft
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:24:28 PM

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Feb 25, 2026

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There are alternatives available now to crab's blood. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James Hadcroft
356 Gifford St
Falmouth, MA 02540-2912
(508) 555-1212
jamzac@hotmail.com

From: Mass Audubon on behalf of Amy Janovsky
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:24:27 PM

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Horseshoe crabs are an iconic memory for many visitors to Massachusetts. They are unique. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. They need our help.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Amy Janovsky
6 Snowberry Road
Andover, MA 01810
(978) 475-8655
amy.janovsky@gmail.com

From: Mass Audubon on behalf of Kristina Aikens
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:24:27 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Kristina Aikens
17 Woodrow Ave.
Medford, MA 02155
(617) 909-3161
kristina.aikens@gmail.com

From: Mass Audubon on behalf of Erin Johnson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:24:27 PM

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Sincerely,

Ms. Erin Johnson
17 Steplar Xing
Easthampton, MA 01027
(301) 438-3927
erintjohnson6@gmail.com

From: Mass Audubon on behalf of Donna Cooper
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:24:27 PM

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This is an unpleasant choice. Reducing the number of horseshoes crabs used for bait is terrific. The whelk fishery is essentially dead and killing crabs for a dying whelk fishing industry is senseless.

I do urge you to reduce, rather than increase, the number of crabs used for biomedical harvesting as well. A synthetic replacement for amoebocyte lysate is available and wealthy drug companies can easily afford to transition to the new product and complete the necessary comparison studies. These crabs are harvested from one area, taken elsewhere to be bled, then tossed back into the ocean somewhere, if they survive the bleeding. It's cruel and unnecessary.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Donna Cooper
26 Brewster St
Provincetown, MA 02657
(508) 487-0837
dc953@yahoo.com

From: Mass Audubon on behalf of William Platenik
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:11:42 PM

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There are alternatives to using horseshoe crabs' blood so harvesting is not necessary but people look for the easiest and cheapest alternative no matter how it harms the plant and the flora and fauna that live here.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. William Platenik
45 St Clair Road
Brimfield, MA 01010
(413) 245-3418
wcp99@charter.net

From: Mass Audubon on behalf of Erica Wainer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:11:41 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Erica Wainer
26 Gould Road
Andover, MA 01810
(781) 710-2311
ericawainer@gmail.com

From:	Mass Audubon on behalf of Wrenn Reed
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Wednesday, February 25, 2026 10:11:40 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Wrenn Reed
1550 Beacon St
Brookline, MA 02446-2216
(617) 314-3691
reedthenns@aol.com

From: Mass Audubon on behalf of Richelle Berard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:11:40 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Richelle Berard
40 Fenno St
Cambridge, MA 02138-6718
(508) 498-9640
richelle.berard@gmail.com

From: Mass Audubon on behalf of Eileen Velez
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:11:40 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Eileen Velez
1153 Hyde Park Ave
Hyde Park, MA 02136
(617) 694-0444
rockynook@hotmail.com

From: Mass Audubon on behalf of Paul Vekiarides
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 10:11:40 PM

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Beyond their endangerment, they are an incredible species that feel indicative of New England beaches. They are essential in making sure our environment is biodiverse and I urge the council to prioritize our marine ecosystems especially in this time of unprecedented sea level rise and warming.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Paul Vekiarides
463 Weld Street
West Roxbury, MA 02132
(617) 637-2331
paulvekiarides@gmail.com

From: Mass Audubon on behalf of Margaret Stolarczuk
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:26 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Margaret Stolarczuk
22 Beach Road
Sharon, MA 02067
(415) 640-2294
ecoms@ymail.com

From: Mass Audubon on behalf of Arthur McClelland
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:26 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Arthur McClelland
26 Albion Street
Somerville, MA 02143
(734) 660-3756
artmcclelland@gmail.com

From: Mass Audubon on behalf of Eleanor Jones
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:26 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Eleanor Jones
2 Sacramento St Apt 2, Apt 2
CAMBRIDGE, MA 02138
(617) 645-8338
joneseleanor6@gmail.com

From: Mass Audubon on behalf of Darlene Carpenter
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:26 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Darlene Carpenter
205 LINDEN PONDS WAY APT 614
Hingham, MA 02043
(781) 385-7125
dkcarpenter7@gmail.com

From: Mass Audubon on behalf of Jessica Hamerly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:24 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jessica Hamerly
Gloucester st
Arlington, MA 02476
(857) 654-7743
beachpea1@gmail.com

From: Mass Audubon on behalf of Linda Willse
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:23 PM

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Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Linda Willse
36 Driftway Rd
North Weymouth, MA 02191
(781) 561-5333
lindawillse@yahoo.com

From: Mass Audubon on behalf of Melissa Melissa
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:54:23 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Melissa Melissa
86 Brigham Street
HUDSON, MA 01749
(978) 875-3322
melissaleefrench@gmail.com

From: Mass Audubon on behalf of Jonathan White
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:39 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jonathan White
46 Johnson Rd
Uxbridge, MA 01569
(508) 278-7735
jonathanwhite46@charter.net

From: Mass Audubon on behalf of Sarah Blodgett
To: Marine Fish (FWE)
Subject: Protect Horseshoe Crabs
Date: Wednesday, February 25, 2026 9:41:39 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Please protect the horseshoe crabs, clearly as an ancient creature they're doing something right and vital with their existence.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah Blodgett
9 Coniston Rd
Roslindale, MA 02131-1516
(413) 584-4845
sarahbethblodgett@gmail.com

From: Mass Audubon on behalf of Hank Allan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:39 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Hank Allan
119 Ninigret Avenue
Mashpee, MA 02649
(413) 559-7373
hanksails@gmail.com

From: Mass Audubon on behalf of Dawn Eriksen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:37 PM

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Feb 25, 2026

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Sincerely,

Dr. Dawn Eriksen
523 Autumn Lane
Carlisle, MA 01741
(978) 758-8670
dawneriksen@gmail.com

From: Mass Audubon on behalf of Dana Bourque
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:37 PM

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Sincerely,

Ms. Dana Bourque
36 Lincoln Ave
Winchendon, MA 01475
(617) 875-9920
drbourque@yahoo.com

From: Mass Audubon on behalf of Danielle Hanrahan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:37 PM

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Sincerely,

Ms. Danielle Hanrahan
28 Beckford St
Salem, MA 01970
(617) 905-2792
dh@dhcolor.com

From: Mass Audubon on behalf of Mike MacGillivray
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:37 PM

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Sincerely,

Mr. Mike MacGillivray
8 Vincent Ave
Belmont, MA 02478
(617) 335-2280
mike.macgillivray@gmail.com

From: Mass Audubon on behalf of Anastasia Karasoulos-Vekiarides
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:37 PM

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Sincerely,

Ms. Anastasia Karasoulos-Vekiarides
463 Weld Street
Boston, MA 02132
(617) 323-3115
anastasia@syntactix.com

From: Mass Audubon on behalf of Alison Sanders-Fleming
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:36 PM

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Alison Sanders-Fleming
77 Pemberton St 1
Cambridge, MA 02140-1932
(617) 653-6471
alisonsf@comcast.net

From: Mass Audubon on behalf of Cynthia Salamon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:36 PM

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Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cynthia Salamon
403 Bedford St
Lakeville, MA 02347
(732) 586-6888
cindylu15@icloud.com

From: Mass Audubon on behalf of Myra Goodwin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:41:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I have been observing horseshoe crabs for over 73 years. They are an integral part of the Massachusetts shoreline and have their place in its ecology. It is important to preserve this. Witnessing the mating in May is a magical and primal sight to behold and something we should honor and protect, not destroy.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Myra Goodwin
50 Westview Terrace
Easthampton, MA 01027
(413) 552-6332
goodmol@hotmail.com

From: Mass Audubon on behalf of Jana Pickard-Richardson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:28 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jana Pickard-Richardson
89 Montebello Rd. Apt. 3
Boston, MA 02130
(617) 599-3827
janainboston@gmail.com

From: Mass Audubon on behalf of Chris O"Gahan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:26 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Chris O'Gahan
583 Edmands Rd
Framingham, MA 01701-3088
(508) 816-2948
chrisogahan@gmail.com

From: Mass Audubon on behalf of Charlotte Rublee
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:26 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Charlotte Rublee
10 Avon Street
Cambridge, MA 02138
(617) 547-8737
charlotterublee52@gmail.com

From: Mass Audubon on behalf of Rene Richard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:23 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Rene Richard
318 Sterling Street E-6
WEST BOYLSTON, MA 01583
(508) 835-2254
reneprichard111@gmail.com

From: Mass Audubon on behalf of Sandra Pagliarulo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:23 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sandra Pagliarulo
17 Donovans Way
Middleton, MA 01949-1930
(978) 762-0651
sandypagliarulo@gmail.com

From: Mass Audubon on behalf of Laura Kozachek
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:23 PM

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Feb 25, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

There are alternatives to reduce the unsupportable taking of horseshoe crabs currently jeopardizing the population.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Laura Kozachek
293 Granite Street
Rockport, MA 01966
(978) 546-1073
lykozachek@gmail.com

From: Mass Audubon on behalf of Lisa Waag
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:24:22 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. I've observed shorebird populations declining over the years along the Cape shores of Nantucket Sound. Please act to support wildlife populations in MA.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lisa Waag
15 Little Oak Lane
South Chatham, MA 02659
(650) 728-7088
lwaag@yahoo.com

From: Mass Audubon on behalf of Sandra Schieferl
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:36 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please do the right thing

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Sandra Schieferl
32 Coles Island Rd
Gloucester, MA 01930-1507
(978) 595-7102
schieferlsandra@gmail.com

From: Mass Audubon on behalf of Pilar Keyes
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:36 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Pilar Keyes
6 Eastover Road
Walpole, MA 02081
(617) 314-3673
pilarjun60@gmail.com

From: Mass Audubon on behalf of Diane Maynard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Sincerely,

Ms. Diane Maynard
100 Village Way
Westport, MA 02790
(508) 280-8248
dgmay906@gmail.com

From: Mass Audubon on behalf of Leonard Rabinow
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
There is no longer any reason to harvest horseshoe crabs for pharmaceutical testing, and using the species for any reason other than the benefits its availability provides to migrating and rare birds as a food source seems ridiculously short-sighted in today's day and age.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Leonard Rabinow
43 Bowdoin St
Newton, MA 02461
(617) 969-2532
maisonorsay@hotmail.com

From: Mass Audubon on behalf of Meredith Stoddard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Sincerely,

Ms. Meredith Stoddard
20 Whittier St
Cambridge, MA 02140-2606
(617) 306-4286
moonblue01@gmail.com

From: Mass Audubon on behalf of Ruth Schechter
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ruth Schechter
47 dunster Road
Boston, MA 02130
(617) 522-8886
ruthsch46@gmail.com

From: Mass Audubon on behalf of Christin Eigenmann
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Horseshoe crabs have been around since the dinosaurs and are crucial to the circle of life of the ocean & sea birds. Please help protect them so that future generations get to admire them and how they are connected to other species. There is no need to catch them for bait anymore and there is also no need anymore to bleed them since we have other viable alternatives available. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Christin Eigenmann
29 Howe St
Hingham, MA 02043-1218
(781) 428-5561
ceigenmann77@gmail.com

From: Mass Audubon on behalf of Suzanna Garfunkel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Suzanna Garfunkel
8 VIllage Rock Lane
Natick, MA 01760
(508) 561-4496
suzanna.garfunkel@gmail.com

From: Mass Audubon on behalf of Diane Adams
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:11:34 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Diane Adams
33 Dodge St
Arlington, MA 02474-1466
(781) 641-1823
adamslis@aol.com

From: Mass Audubon on behalf of Deb Baumgarten
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:54:21 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Deb Baumgarten
60 Short St.
Bridgewater, MA 02324
(774) 240-1307
catsmeow908@verizon.net

From: Mass Audubon on behalf of Judith Livingstone
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:54:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Judith Livingstone
PO BOX 776, East Dennis, Massachusetts 02641
East Dennis, MA 02641
(508) 385-3723
jlivingstone123@verizon.net

From: Mass Audubon on behalf of Chris Kosta
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:54:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Chris Kosta
90 Converse Ave
Malden, MA 02148
(617) 549-4678
clkosta@hotmail.com

From: Mass Audubon on behalf of Judy Belaval
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:54:19 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Horseshoe crabs are an ancient remarkable species that have survived since prehistoric. times.
They need to be protected.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Judy Belaval
58 Orchard street
Boston, MA 02130
(203) 623-9659
notophthalmus@snet.net

From: Mass Audubon on behalf of Michelle Durocher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:54:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

In addition to adding necessary protections for horseshoe crab populations, this ancient species is a vital part of the shoreline ecosystem. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Michelle Durocher
65 Huntington Rd
Arlington, MA 02474
(857) 205-5125
michellemdurocher@hotmail.com

From: Mass Audubon on behalf of Rachel Fitzgerald
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:36 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I want my children to grow up learning about and respecting the natural world. I hope that you will help protect it for their generation and those to follow -- because it's the right thing to do.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rachel Fitzgerald
84 MacArthur Rd
Natick, MA 01760
(781) 314-2121
rachel.engelson@gmail.com

From: Mass Audubon on behalf of Victoria Olson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:34 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Victoria Olson
458 Sodom Rd
Westport, MA 02790-4947
(860) 878-4075
mooster1@gmail.com

From: Mass Audubon on behalf of Martha Jorz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:32 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Martha Jorz
497 E Pleasant St Apt 25
Amherst, MA 01002-3734
(413) 695-8166
mjjorz@protonmail.com

From: Mass Audubon on behalf of Winfield Perry
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:31 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
As a long term summer resident in Brewster on Cape Cod, we have observed the decline in the number of horseshoe crabs. We need to act to reverse the decline of this unique and fascinating species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Winfield Perry
137 Grant Street
Lexington, MA 02420
(617) 794-0224
wbperry@aol.com

From: Mass Audubon on behalf of KENNETH PIVA
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:31 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. KENNETH PIVA
2 STRATFORD DR
NORTH DARTMOUTH, MA 02747-3800
(508) 990-3037
kjpiva@gmail.com

From: Mass Audubon on behalf of DayAnn Kelley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:31 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Growing up near a beach north of Boston I remember seeing horse shoe crabs in the summer. Now I only see them on Cape Cod. It's important to saves these ancient crustaceans. Please propose rules to do so.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. DayAnn Kelley
2 Goodwin Rd
Beverly, MA 01915
(978) 578-4754
dayannk@icloud.com

From: Mass Audubon on behalf of Sharon Lindsay
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:30 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sharon Lindsay
123 Charles Street
Leicester, MA 01524
(508) 892-4399
shaleic@verizon.net

From: Mass Audubon on behalf of Mary Kentros
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:30 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Mary Kentros
46 Pond Rd
West Tisbury, MA 02575
(914) 494-9986
mkentros@optonline.net

From: Mass Audubon on behalf of Caterina Nelson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:41:30 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Caterina Nelson
100 Burrill St. Unit 5
Swampscott, MA 01907
(617) 304-3481
catknelson@gmail.com

From: Mass Audubon on behalf of Judith Glixon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:22 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Judith Glixon
2 Aerial Street
Lexington, MA 02421
(781) 521-0353
jglixon@verizon.net

From: Mass Audubon on behalf of Betsey Dalbeck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Betsey Dalbeck
16 Beechwood Road
Waltham, MA 02453
(617) 697-7751
betseydalbeck@gmail.com

From: Mass Audubon on behalf of Karl Spigulis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:21 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Karl Spigulis
16 Village Road
Weston, MA 02493-1338
(617) 669-0874
kspigulis@hotmail.com

From: Mass Audubon on behalf of Deborah Bigwood
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:20 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Using horseshoe crabs as bait is cruel and wasteful, however, I also do not agree with the biomedical use of horseshoe crabs, which is also cruel. They should be protected, period. It makes no sense to favor one cruel exploitation over another:

1. The Procedure: Crabs are brought to labs, restrained, and often have their hearts pierced to drain their bright blue, copper-based blood, a process that takes about eight minutes.
2. High Mortality & Stress: While many are returned to the sea, a significant percentage die from the stress of the procedure, transportation, and blood loss.
3. Long-term Effects: Studies show that bled crabs are only half as likely to come ashore to breed, severely impacting their population.
4. Impact on Ecosystems: The declining population of horseshoe crabs directly threatens shorebirds, such as the endangered red knot, which rely on the crabs' eggs for food during migration.

Nearly 1 million horseshoe crabs are taken from the wild every year and used for their blue blood, which contains a special protein that can test for contamination of medical products. Once captured, they are transported to laboratories, where they are strapped into restraints.

They are pierced through the heart so up to one-third of their blood can slowly be drained before they are returned to the ocean. After this ordeal, these animals are often too weak to fend for themselves in the wild; many are left dead or injured.

There are synthetic alternatives to the biomedical exploitation of horseshoe crabs:

*Recombinant Factor C (rFC): A synthetic, animal-free alternative exists that is equally effective at detecting contaminants.
*Changing Standards: The U.S. Pharmacopeia has issued guidance to encourage using synthetic alternatives over animal-derived LAL, potentially reducing future reliance on the creatures.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Deborah Bigwood
225 Cohasset Street
Worcester, MA 01604
(508) 757-3169
deb.bigwood21@gmail.com

From: Mass Audubon on behalf of Christine Young
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Christine Young
2 Garden St
West Newbury, MA 01985
(603) 828-4822
neighs.prince-5w@icloud.com

From: Mass Audubon on behalf of John Hillier
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. John Hillier
10 Jane Ln
Mattapoisett, MA 02739
(617) 852-4195
jack.hillier6631@gmail.com

From: Mass Audubon on behalf of Richard Rogers
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:18 PM

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Feb 25, 2026

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It's important to balance immediate human needs with those of the flora and fauna around us. Please, support all of us by

Thank you!

Richard J. Rogers
Retired Middle School Science Teacher

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Richard Rogers
133 Wakefield St
Reading, MA 01867
(781) 439-2758
rjrogersjr22@gmail.com

From: Mass Audubon on behalf of Margaret McNamara
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Please do all you can to protect these creatures - thank you!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Margaret McNamara
58 Cherry Street #15
Somerville, MA 02144
(617) 792-0638
mcnamara_margaret@hotmail.com

From: Mass Audubon on behalf of George Bain
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:24:18 PM

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Sincerely,

Dr. George Bain
18 Eastleigh Ln
Natick, MA 01760-4275
(508) 314-7954
gbain@bu.edu

From: Mass Audubon on behalf of Patricia Burdick
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:32 PM

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Sincerely,

Ms. Patricia Burdick
180 Dudley Road
Newton Centre, MA 02459
(617) 969-0414
patburdick@aol.com

From: Mass Audubon on behalf of Jennie Rathbun
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:29 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennie Rathbun
1516 Massachusetts Ave
Arlington, MA 02476-4119
(617) 460-5443
jhrathbun@gmail.com

From: Mass Audubon on behalf of Ann Bodkhe
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:29 PM

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Dear Director McKiernan,

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Let's not lose more bitds. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Ann Bodkhe
30 Shepard Rd
Charlemont, MA 01339
(413) 625-9455
abodkhe@icloud.com

From: Mass Audubon on behalf of Maria Nolen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:29 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maria Nolen
299 Strawberry Hill Rd
Concord, MA 01742
(805) 746-3476
rianolen@gmail.com

From: Mass Audubon on behalf of Erin Leonard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:29 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Erin Leonard
337 Springs Road
Bedford, MA 01730
(781) 808-1321
ekelly5@alumni.nd.edu

From: Mass Audubon on behalf of Tod Christie
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:28 PM

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Feb 25, 2026

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Dear Director McKiernan,

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I first vacationed on the Cape with my parents on the Cape in the 1970s. We regularly saw horseshoe crabs in the Bay. More recently, I have worked as a volunteer for Mass Audubon's Wellfleet Bay Wildlife Sanctuary monitoring horseshoe crabs during spawning season. I was shocked to see how few crabs we observed.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds such as red knots are among the most rapidly declining group of birds and need horseshoe crab eggs to survive their migration of thousands of miles to their breeding grounds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Tod Christie
995 Old Orchard Rd
Eastham, MA 02642
(201) 406-0464
tod.christie@gmail.com

From: Mass Audubon on behalf of Mary Ann Agresti
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:28 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Ann Agresti
17 Point If Rocks Rd
Yarmouth Port, MA 02675
(617) 515-5418
magresti7@gmail.com

From: Mass Audubon on behalf of David Morgan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:28 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Morgan
5 Winter St
Arlington, MA 02474
(413) 341-7578
david.morgan@mailbox.org

From: Mass Audubon on behalf of Walt Luerken
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:28 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Walt Luerken
142 Woodward Ave.
Seekonk, MA 02771
(508) 336-3922
waltluerken@comcast.net

From: Mass Audubon on behalf of Johnstone Campbell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:28 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Johnstone Campbell
5 Gamelin St Apt 231
Holyoke, MA 01040
(413) 588-8763
johnsandycamp@gmail.com

From: Mass Audubon on behalf of Marissa Cashman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 8:11:28 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Marissa Cashman
1067 Main Street
Lynnfield, MA 01940
(781) 249-3685
marissa.cashman1@gmail.com

From: Mass Audubon on behalf of Elizabeth Szymanski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:19 PM

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Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Elizabeth Szymanski
9 Purcell Drive, Billerica, MA
Billerica, MA 01821-2802
(978) 376-2174
bethmolaskey@yahoo.com

From: Mass Audubon on behalf of Johanna Haagens
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:18 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Johanna Haagens
29 Violetwood Cir
Marlborough, MA 01752
(508) 667-5659
johanna5842@gmail.com

From: Mass Audubon on behalf of Susan Harris
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:18 PM

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Horseshoe crabs are an amazing species. I will never forget the close encounter I had with one on a Cape Cod beach. Please do all you can to protect them. Thank you.

Sincerely, Sue Harris

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Harris
524 Elm St
Concord, MA 01742
(339) 970-1941
sharris_lex@yahoo.com

From: Mass Audubon on behalf of Danielle Oaks
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Danielle Oaks
29 Walton St #2
Dorchester, MA 02124
(401) 474-9791
danielle.oaks@gmail.com

From: Mass Audubon on behalf of Christine Doyle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Christine Doyle
103 Jefferson Street
Dedham MA, MA 02026
(617) 791-0065
christinedoyle0911@gmail.com

From: Mass Audubon on behalf of Karen Jolie
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:17 PM

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Sincerely,

Ms. Karen Jolie
94 Osgood Road
Sterling, MA 01564
(978) 273-4319
kjolie@comcast.net

From: Mass Audubon on behalf of Ellen Levine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:17 PM

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Sincerely,

Ms. Ellen Levine
67 Pigeon Hill St
Rockport, MA 01966
(978) 290-2283
ellevine@yahoo.com

From: Mass Audubon on behalf of Andrea Ravenelle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:16 PM

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Sincerely,

Mrs. Andrea Ravenelle
64 North Cross Road
North Andover, MA 01845
(508) 737-5773
andrearavenelle@gmail.com

From: Mass Audubon on behalf of Clare DEUCHER
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:15 PM

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Horseshoe crabs have been wandering this earth far longer than humans. We ought to act to ensure their survival as a species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Clare DEUCHER
133 Rindge Tpke
Ashburnham, MA 01430
(978) 345-8765
cmdeucher@comcast.net

From: Mass Audubon on behalf of Roberta Hershon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:54:14 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I hope you believe in this worthwhile effort as much as I do.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Roberta Hershon
170 Monroe St.
Dedham, MA 02026
(781) 449-6292
roberta@blueplate.com

From: Mass Audubon on behalf of Karen Bump
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:36 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Sincerely,

Ms. Karen Bump
26 Tyringham Road
Becket, MA 01223
(508) 331-1347
speedbump16@proton.me

From: Mass Audubon on behalf of William Brotherton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:35 PM

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Feb 25, 2026

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Sincerely,

Dr. William Brotherton
17 Blue Rock Rd.
Orleans, MA 02653
(508) 255-2516
broton@alum.mit.edu

From:	Mass Audubon on behalf of Bruce Hawkins
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Wednesday, February 25, 2026 7:41:32 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Bruce Hawkins
26 Crescent St Apt 206
Northampton, MA 01060-2188
(413) 584-2788
bhawkins@smith.edu

From: Mass Audubon on behalf of Margaret Carroll
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:31 PM

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Feb 25, 2026

Director Daniel McKiernan

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Sincerely,

Ms. Margaret Carroll
395King Philip Rd
Wellfleet, MA 02667
(617) 818-6559
mcarroll@wellesley.edu

From: Mass Audubon on behalf of Amy Kelly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:30 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Amy Kelly
49 Moon Compass Lane
Sandwich, MA 02563
(857) 919-2365
amy.lou.kelly@gmail.com

From: Mass Audubon on behalf of David Talamo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:30 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Talamo
5 Highgate Road
Framingham, MA 01701
(508) 308-6349
dtalamo14@gmail.com

From: Mass Audubon on behalf of Wendy Seymour
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:30 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Wendy Seymour
34 Pratt St
Billerica, MA 01821
(781) 696-7056
iamwendylouwho@gmail.com

From: Mass Audubon on behalf of Christopher O"Shea
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:30 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Christopher O'Shea
100 Fayette St.
Watertown, MA 02472
(413) 426-3535
misirlou22@gmail.com

From: Mass Audubon on behalf of Daniela Fernandez Gine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:29 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Daniela Fernandez Gine
53 Irving St
Newton, MA 02459
(989) 492-6640
daniela.gine@gmail.com

From: Mass Audubon on behalf of MICHAEL BUONAIUTO
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:28 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As a seasonal resident of Cape Cod for 40 years, I have witnessed the decline of the horseshoe crab population due to overfishing. Please support DNF's proposal.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. MICHAEL BUONAIUTO
77 Kensington Park
Arlington, MA 02476
(781) 608-4009
mjbuonaiuto@gmail.com

From: Mass Audubon on behalf of Maureen Sullivan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:28 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maureen Sullivan
235 Mount Vernon St
West Newton, MA 02465
(617) 799-2678
maureenrsullivan@icloud.com

From: Mass Audubon on behalf of John Saltmarsh
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:26 PM

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Sincerely,

Dr. John Saltmarsh
19 Mathews Drive
Wayland, MA 01778
(617) 306-7305
john.saltmarsh@gmail.com

From: Mass Audubon on behalf of Jolene Hart
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:26 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jolene Hart
129 Meadow St
Amherst, MA 01002
(413) 336-2251
jolene.hart@comcast.net

From: Mass Audubon on behalf of Paulette Vartabedian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:25 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. These crabs have been on earth since prior to even the dinosaurs.. are we humans going to wipe them out for our own selfish reasons esp when there are equally if not better ways to gather the same desired results ? Also a huge percentage of of those crabs that are released after blood drainage, die.. stop these cruel & unnecessary harvests. Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Paulette Vartabedian
27 Central Ave
Medford, MA 02155
(123) 456-7890
pivartabedian@gmail.com

From: Mass Audubon on behalf of Barbara Strell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:25 PM

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Sincerely,

Ms. Barbara Strell
59 Sterling St
Somerville, MA 02144-1116
(617) 718-1780
strell@rcn.com

From: Mass Audubon on behalf of Oscar Moradei
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:24 PM

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Sincerely,

Dr. Oscar Moradei
7 Crossman Road
Woburn, MA 01801
(781) 475-0495
oscar.moradei@gmail.com

From: Mass Audubon on behalf of Petra Reitz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:24 PM

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Sincerely,

Ms. Petra Reitz
1410 Washington St
East Bridgewater, MA 02333
(339) 832-0152
petra_r_@hotmail.com

From: Mass Audubon on behalf of Ellen Manning
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:24 PM

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Sincerely,

Ms. Ellen Manning
20 Bay Pointe Drive Extension
Buzzards Bay, MA 02532
(321) 961-6736
manning.ellenm@gmail.com

From: Mass Audubon on behalf of Barbara Talbot
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:41:23 PM

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Sincerely,

Mr. Barbara Talbot
70 Oakes Dr
North Andover, MA 01845-4810
(978) 726-5665
barbarat64@verizon.net

From: Mass Audubon on behalf of Barbara Abraham
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:18 PM

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Sincerely,

Ms. Barbara Abraham
34 Cumberland Rd
Leominster, MA 01453
(978) 534-8521
abrahambarbara326@gmail.com

From: Mass Audubon on behalf of Alan Papscun
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:16 PM

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Sincerely,

Mr. Alan Papscun
40 Glendale Rd.
Stockbridge MA, MA 01262
(413) 298-7260
alan@papscun.com

From: Mass Audubon on behalf of Karl Kastorf
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:16 PM

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I live on the shore. When I was a kid or shoe crabs were plentiful. Now it's an exciting experience to see even one.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Karl Kastorf
34 America Way
Salem, MA 01970
(978) 495-2035
kkastorf@verizon.net

From: Mass Audubon on behalf of Janet Fox
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:15 PM

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Sincerely,

Ms. Janet Fox
4 Hardy Rd
Ashburnham, MA 01430
(781) 701-5131
janet@tiferet.com

From: Mass Audubon on behalf of Everett Lacerda
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:15 PM

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
When my children and grandchildren were young we would walk the beaches around Winsegansett pond and find many recently shed horseshoe exoskeletons. These always created a sense of awe in the children as they tried to figure out how they got out of the shell. We would occasionally find an adult healthy and happy in the surf. In recent years,a walk in the same area finds none of these. The terns and sandpipers in the area have also left. Steps should be taken to restore this once vibrant area and I believe the horseshoe crabs played a major role in that process.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Everett Lacerda
17 Susan Lane
Middleborough, MA 02346
(508) 947-0772
erlac@comcast.net

From: Mass Audubon on behalf of Alice Kellogg
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alice Kellogg
94 Mendon St
Upton, MA 01568-1436
(914) 588-6870
alice.kellogg@gmail.com

From: Mass Audubon on behalf of Jane Fitzgerald
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:14 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jane Fitzgerald
57 Prescott St
Rutland, MA 01543
(508) 648-4259
jfmusicstudio@gmail.com

From: Mass Audubon on behalf of Kristin Kelley-Munoz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:13 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As a family that vacations down the Cape each summer, quite close to Monomoy, we absolutely loves seeing the horseshoe crash each year as we kayak in the beautiful sañt marches. They are an important part of a very delicate, endangered part of the marine ecosistem our Commonwealth has the great privelwg of caring for.

Please do everything in your power to protect these naciente creatures.

Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kristin Kelley-Munoz
113 South Shaker Rd
Harvard, MA 01451-1208
(617) 875-9691

skiingweaver@gmail.com

From: Mass Audubon on behalf of Stephen Sireci
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:13 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Stephen Sireci
50 Union Street
Northampton, MA 01060
(413) 545-0564
sireci@acad.umass.edu

From: Mass Audubon on behalf of Alice Ploysungwan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:24:13 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Alice Ploysungwan
1 Mason Drive
North Grafton, MA 01536
(508) 868-9937
aploysungwan@gmail.com

From: Mass Audubon on behalf of Karen Nelson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:26 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Karen Nelson
101 Cherry St
Shrewsbury, MA 01545
(508) 395-2211
karen.nelson4745@gmail.com

From: Mass Audubon on behalf of Cathy Greene
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:24 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are an ancient species, so important in scientific research and a window into prehistoric ocean life.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cathy Greene
62 Willow Ridge Rd
North Andover, MA 01845
(617) 538-0503
nacath@aol.com

From: Mass Audubon on behalf of Lyn Kertesz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:24 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lyn Kertesz
18 Louisberg st
Lawrence, MA 01843
(352) 464-4292
foocat57@atlantic.net

From: Mass Audubon on behalf of Eve Elizondo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:23 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Eve Elizondo
37 Storrow Circle
Westwood, MA 02090
(781) 856-7846
eqelizondo@gmail.com

From: Mass Audubon on behalf of Julie Wigmore
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:23 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Julie Wigmore
765 East New Lenox Rd
Pittsfield, MA 01201
(413) 834-0174
jfwigmore@gmail.com

From: Mass Audubon on behalf of Ann Cohen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:22 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Ann Cohen
343 Cabot St
Newtonville, MA 02460
(617) 319-3004
anntee@comcast.net

From: Mass Audubon on behalf of James Briggs
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:22 PM

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Feb 25, 2026

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I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Growing up on Quincy bay we saw horseshoe crabs a few times a week and now we are lucky to see them once during the summer. Please help save them.

Thanks,
Jim

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James Briggs
54 Ocean Avenue
North Weymouth, MA 02191
(781) 335-6372
briggs.jim@gmail.com

From: Mass Audubon on behalf of Elana Katz Rose
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:21 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elana Katz Rose
1 Pond View Circle
Sharon, MA 02067
(508) 789-2288
elanakatz@yahoo.com

From: Mass Audubon on behalf of Shelley Monaghan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:21 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Shelley Monaghan
12 Conant Drive
Brockton, MA 02301
(508) 930-6723
shelleyn@comcast.net

From: Mass Audubon on behalf of Melissa Grondin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:21 PM

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Feb 25, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Melissa Grondin
8 Fairview AveApt 1
Malden, MA 02148
(781) 321-7448
melissajgrondin@yahoo.com

From: Mass Audubon on behalf of Ralph Robinson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:20 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ralph Robinson
111 Clifton St.
Cambridge, MA 02140
(805) 300-9283
surfdogs@gmail.com

From: Mass Audubon on behalf of Carol Waag
To: Marine Fish (FWE)
Subject: I urge you to approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:20 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I have observed horseshoe crabs on the shores of Nantucket Sound for over 50 years. I try to catch May spawning near Stage Harbor when I can. My personal experience is that there are less today then when I started observing them. We need to regulate their harvest and bring their numbers to a sustainable level for future generations.

Horseshoe crab eggs are also a crucial resource for migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebird numbers are declining drastically.

Harvesting the crabs for the biomedical industry and bait must continue to be limited. Thank you for increasing protections for this amazing creature.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carol Waag
15 Little Oak Lane
South Chatham, MA 02659
(413) 329-8988
carolewaag@gmail.com

From: Mass Audubon on behalf of Sara Howard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:20 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sara Howard
6 High Street
Florence, MA 01062
(413) 345-6798
saramaehoward@gmail.com

From: Mass Audubon on behalf of Amanda Locke
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Amanda Locke
10 Oak Hill Acres
Greenfield, MA 01301
(413) 773-5415
robinmandyhome@gmail.com

From: Mass Audubon on behalf of Nancy Braun
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Nancy Braun
510c Shore Rd.
North Truro, MA 02652
(413) 297-2785
nancytruro@gmail.com

From: Mass Audubon on behalf of Kristin Masefield
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:20 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kristin Masefield
5 Timothy Dr.
West Bridgewater, MA 02379
(617) 513-3308
kmmasefield@yahoo.com

From: Mass Audubon on behalf of Sara Alderson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:19 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Sincerely,

Ms. Sara Alderson
4B Allen Street
Natick, MA 01760
(508) 579-1816
saramichelle@gmail.com

From: Mass Audubon on behalf of James Henle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 7:11:19 PM

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Sincerely,

Mr. James Henle
45 Hall St Apt 1
Jamaica Plain, MA 02130
(617) 895-6105
jhenle1729@gmail.com

From: Mass Audubon on behalf of Paul Williams
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:17 PM

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Sincerely,

Mr. Paul Williams
11 Bay View Dr
Shrewsbury, MA 01545
(774) 502-3375
prwilliams@townisp.com

From: Mass Audubon on behalf of Ann Penni
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:15 PM

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Sincerely,

Mrs. Ann Penni
97 Swallow Hill Dr
Barnstable, MA 02630
(508) 825-4425
annpenni@comcast.net

From: Mass Audubon on behalf of Diane Krause
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:15 PM

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Sincerely,

Ms. Diane Krause
68 High Haith Rd.
Arlington, MA 02476
(781) 641-1846
samburu@comcast.net

From: Mass Audubon on behalf of Frances M Bancroft
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:14 PM

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Sincerely,

Ms. Frances M Bancroft
320 Spencer Drive
AMHERST, MA 01002-3367
(617) 775-1760
fran.bancroft@comcast.net

From: Mass Audubon on behalf of Judith Hennessy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Judith Hennessy
51 1/2 Hatfield St
Northampton, MA 01060
(413) 548-5026
jhenne24@gmail.com

From: Mass Audubon on behalf of Michael McCarthy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:14 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Michael McCarthy
1402 Lagrange Street
Chrstnut Hill, MA 02467
(617) 335-5403
mfmccarthy@hotmail.com

From: Mass Audubon on behalf of Ronald M Hansen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:14 PM

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Horseshoe crab eggs are a crucial food source for shorebirds during migration. They provide nutrients necessary for migration to breeding areas in the far north. In Massachusetts, we are fortunate to see these amazing migrants on our beaches. . Shorebirds are among the most rapidly declining group of birds. So protecting this resource is essential.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Ronald M Hansen
51 Buchanan Street
Winthrop, MA 02152
(617) 894-9253
rmghansen@gmail.com

From: Mass Audubon on behalf of Maria Leo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:54:13 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maria Leo
294 Adams St
Newton, MA 02458
(617) 347-2296
rations-codes.3e@icloud.com

From: Mass Audubon on behalf of Lisbeth Kuerzel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:26 PM

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Feb 25, 2026

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As a lifelong Massachusetts resident, I spent much of my childhood summers on Breakwater Beach in Brewster, MA. As the largest tidal flat in North America, it was home to a multitude of plodding, prehistoric Horseshoe crabs (as well as clams, mussels, hermit crabs, and so much more). In recent years when I venture back to the area, I am not able to find Horseshoe Crabs as they have been harvested to near depletion. When I discovered as an adult that the animals are harvested for their blood, it broke my heart that they were being taken out of habitat, hooked up to machines that bled them, and then unceremoniously dumped back on the beach, with 30% of those not surviving the ordeal. Unless we make a change, now, these 'living fossils' will go the way of the Bachman's warbler and the dodo, leaving shorebirds without an important food source, and our Massachusetts coastline without one of its oldest residents. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds at this time. Please help save these ancient creatures by disallowing their population to be decimated by us.
Sincerely,
Lisbeth Kuerzel
Shutesbury, MA
lisakuerzel@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species

to historic population levels.

Sincerely,

Ms. Lisbeth Kuerzel
210 Leverett Road
Shutesbury, MA 01072
(617) 710-6084
lisakuerzel@gmail.com

From: Mass Audubon on behalf of Louis Ferrari
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:25 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I don't see as many on the beach as I used too!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Louis Ferrari
450 East Sixth Street
South Boston, MA 02127
(617) 269-1777
ferrarilaw@gmail.com

From: Mass Audubon on behalf of Kathryn Kaufman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:24 PM

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Feb 25, 2026

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Sincerely,

Ms. Kathryn Kaufman
100 State Street
Framingham, MA 01701
(508) 626-4792
kkaufman@framingham.edu

From: Mass Audubon on behalf of Christine Restell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:24 PM

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Sincerely,

Mrs. Christine Restell
POBox 638
Sterling, MA 01564
(978) 870-2551
ardeablue3@gmail.com

From: Mass Audubon on behalf of Peter Gailitis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:24 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I am a recovering cancer patient, and have also been a fisherman. Watching crabs being harvested is appalling, whether for bait or for research. People catch crabs and hurl them into to the boat with no concern for injuries to the animals. The end use doesn't make the harvest more humane, because ultimately it is all about the money they expect to get. Supposedly there is a premium paid for alive specimens, I don't know. Also, is there a control on bringing them from another state? Regulation definitely needed.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Peter Gailitis
47 Pond St
Belmont, MA 02478
(401) 855-6838
peterjgailitis@gmail.com

From: Mass Audubon on behalf of Pilar Quintana
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:23 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

All wildlife is very important to me and my family, and we love the shorebirds. But we care equally about the horseshoe crabs and look forward to the day when we completely phase out the unnecessary and unsustainable bait harvest. And although we find the biomedical harvest less destructive than the bait harvest, we strongly believe the biomedical industry should transition to use of synthetic alternatives.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Pilar Quintana
46 Lorenzo Circle
Methuen, MA 01844
(978) 685-5504
pilarandisabel@gmail.com

From: Mass Audubon on behalf of Jan Whitney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:23 PM

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Sincerely,

Mrs. Jan Whitney
11 Myrtle St.
Leominster, MA 01453
(978) 660-3804
jkwmcgee@gmail.com

From: Mass Audubon on behalf of Liana Toscanini
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:23 PM

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I grew up on Long Island Sound and Horseshoe crabs were part of our beach landscape. I used to be terrified of stepping on one! They should be protected as iconic and unique creatures.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Liana Toscanini
186 SANDISFIELD RD
SANDISFIELD, MA 01255-9619
(413) 441-9542
liana@npcberkshires.org

From: Mass Audubon on behalf of Emily Curewitz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:22 PM

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Sincerely,

Ms. Emily Curewitz
53 Hudson Ave
Grafton, MA 01519
(774) 293-0651
emilycurewitz2@yahoo.com

From: Mass Audubon on behalf of laura weingartner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:22 PM

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Sincerely,

Ms. laura weingartner
4 Shaw Rd
East Sandwich, MA 02537
(630) 962-1628
lauraweingartner@yahoo.com

From: Mass Audubon on behalf of Marjorie Short
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Marjorie Short
17 Conant St. Apt. L-211
Beverly, MA 01915
(781) 521-7846
marjorie.short8899@gmail.com

From: Mass Audubon on behalf of Katie Mukai
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Katie Mukai
1477 Beacon St Apt 43
Brookline, MA 02446-4751
(617) 957-4091
kmukai126@gmail.com

From: Mass Audubon on behalf of Barbara Knutson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:21 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. These majestic ancient beings have survived for eons. We should be diligent in saving them. A visit to wellfleet. wildflower sanctuary years ago started my appreciation and understanding.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Barbara Knutson
73 redford dr
Florence, MA 01062
(386) 365-7913
knutson.barbara@gmail.com

From: Mass Audubon on behalf of Mary Palmer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:21 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

The horseshoe crabs are precious. Protect them from harm and unnecessary harvest.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Mary Palmer
30 SUMMER ST
LEE, MA 01238-1110
(413) 243-3607
marpal8@roadrunner.com

From: Mass Audubon on behalf of Kristie Romano
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kristie Romano
45 Washington St Apt 65
Methuen, MA 01844
(978) 555-1212
massaudubon@karaminta.com

From: Mass Audubon on behalf of John Ehrlich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. John Ehrlich
244 Davidson Road
Boxborough, MA 01719-1232
(978) 263-4275
dirigentjwe@verizon.net

From: Mass Audubon on behalf of Mary Vitro
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Vitro
71 Linnell Street
Springfield, MA 01104
(413) 732-8536
woofmeowsit@aol.com

From: Mass Audubon on behalf of Janet Kresl Moffat
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:20 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There are reasonable and reliable alternatives to the horseshoe crab blood so that they need not be removed from the ocean and returned after blood has been removed

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Janet Kresl Moffat
185 Harvard Rd
Stos, MA 01775
(978) 897-2976
moffatjando@verizon.net

From: Mass Audubon on behalf of Nancy Nolan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Nancy Nolan
199 Lexington Street
Auburndale, MA 02466
(781) 866-1978
busterseyes@gmail.com

From: Mass Audubon on behalf of Robert Smyth
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Robert Smyth
29 Josephine Ave
Somerville, MA 02144
(617) 776-2230
smyth.rb@gmail.com

From: Mass Audubon on behalf of Irene Lipshires
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Irene Lipshires
Po Box 192
North Eastham, MA 02651-0192
(508) 361-1807
rene@lipshires.com

From: Mass Audubon on behalf of Philip Rogers
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Philip Rogers
288 Lowell st
Wakefield, MA 01880
(978) 697-7218
rogers6270@aol.com

From: Mass Audubon on behalf of Betty Krikorian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:41:19 PM

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Sincerely,

Ms. Betty Krikorian
73 Edgemoor Road
Belmont, MA 02478
(617) 484-8132
linnbet@aol.com

From: Mass Audubon on behalf of Caitlin Merrill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:17 PM

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Every summer (48 and counting) my family boats on the Essex River. I live looking for horseshoe crabs on the back side of Crane's Beach and on Choate Island. It is always so exciting to see live ones walking in the water. There often malted shells as well and it's so fun to collect them and to have pretend sword battles with my kids on the beach. I Remember as a kid learning how horseshoe crabs were basically unchanged for millions of years ago, and how they had roamed the Earth when the dinosaurs did.
Please work to protect these magnificent creatures so that future generations can also be delighted by them. Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Caitlin Merrill
85 Union St
S Hamilton, MA 01982-2116
(978) 468-1095
caitlinnelson@hotmail.com

From: Mass Audubon on behalf of Ellie Simpson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:16 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Ellie Simpson
19 Chelmsford St
Boston, MA 02122
(215) 939-5816
ellie.simpson519@gmail.com

From: Mass Audubon on behalf of Andrew Laine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Andrew Laine
47 Skyline Drive
WEST YARMOUTH, MA 02673
(774) 212-0868
wanderalien@comcast.net

From: Mass Audubon on behalf of Mary Slayter
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:15 PM

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Sincerely,

Ms. Mary Slayter
3 Pleasant St.
West Dennis, MA 02670
(508) 398-9235
mslayter@yahoo.com

From: Mass Audubon on behalf of McKayla Arsenault
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:15 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. The stability of a precious natural ecosystem is as vulnerable as rows of dominoes that can fall at any moment - it is imperative we take action where possible, and we must do it quickly. Restricting our impacts on the populations of a species (who's been on this planet way longer than we have!) is a responsibility we have to protect the plant and our finite resources.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss McKayla Arsenault
18 South Riverview St
Haverhill, MA 01835
(978) 914-4019
mcarsenault7@gmail.com

From: Mass Audubon on behalf of Michelle O"Hanley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:15 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Nature needs as much help as is possible to survive in the current political climate.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Michelle O'Hanley
50 Maynard St
Attleboro, MA 02703
(508) 345-3603
mohanley19@gmail.com

From: Mass Audubon on behalf of Lois Bartels
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:14 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds, especially Red Knots
In addition, since horseshoe crabs are used as bait for whelk, an industry that cannot be sustained based on population studies, this would give two populations a chance to recover.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lois Bartels
120 Leeward Way
Eastham, MA 02642
(774) 573-4769
loisma58@gmail.com

From: Mass Audubon on behalf of Carol Walker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:13 PM

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Sincerely,

Mrs. Carol Walker
29 Jefferson St.
Winthrop, MA 02152
(617) 846-3608
carwalker58@gmail.com

From: Mass Audubon on behalf of Alan Citron
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:13 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Alan Citron
4 Farrow Street
Winchester, MA 01890-1509
(781) 729-5555
paleotech@verizon.net

From: Mass Audubon on behalf of Danielle Colburn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:13 PM

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Sincerely,

Ms. Danielle Colburn
46 Harley Drive, Apt. 11
Worcester, MA 01606
(978) 235-7716
dncolburn@gmail.com

From: Mass Audubon on behalf of Everett Diggs
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:24:12 PM

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Sincerely,

Mr. Everett Diggs
140 Indian Trail
Barnstable, MA 02630
(804) 678-9689
etdiggs@gmail.com

From: Mass Audubon on behalf of Jacob Sagrans
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:23 PM

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Sincerely,

Dr. Jacob Sagrans
Jacob Sagrans
Weston, MA 02493
(617) 500-8505
sagransj@gmail.com

From: Mass Audubon on behalf of Valerie Leiter
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:23 PM

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Sincerely,

Ms. Valerie Leiter
1 Fitchburg Street
Somerville, MA 02143
(617) 283-6163
valerie.leiter@me.com

From: Mass Audubon on behalf of Elena Ioannisyan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:23 PM

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Sincerely,

Mrs. Elena Ioannisyan
175 BEACON ST
SOMERVILLE, MA 02143
(617) 633-4674
elena.ioann@gmail.com

From:	Mass Audubon on behalf of Heather massey
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Wednesday, February 25, 2026 6:11:22 PM

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Sincerely,

Ms. Heather massey
PO Box 1072
West Falmouth, MA 02574
(508) 457-1612
kenyonintibet1@aol.com

From: Mass Audubon on behalf of Mark Forney
To: Marine Fish (FWE)
Subject: Please move to lower bait horseshoe crab quota
Date: Wednesday, February 25, 2026 6:11:22 PM

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Aside from playing a key role in the survival of a number of migratory shorebird species that consume their eggs to fuel their flights north, horseshoe crabs are themselves environments. Scuds, ghost anemones, Asteriids, snail furs, blue mussels, barnacles, sea strawberries, seal lettuce, red beard sponges, eastern oyster, northern rock barnacles, skeleton shrimps, sand builder worms, bushy bugulas, hard tube worms, flat worms, oyster drill eggs and Agardh's red seaweed all make the carapace of Limulus polyphemus their home.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Mark Forney
136 Village Ave
Dedham, MA 02026
(415) 555-5555
mark.forney@comcast.net

From: Mass Audubon on behalf of Beth Doner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:22 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Beth Doner
PO Box 744
Stockbridge, MA 01262
(413) 441-1721
donerparty@roadrunner.com

From: Mass Audubon on behalf of Renee White
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:22 PM

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Sincerely,

Dr. Renee White
5 Ida Rd
Marblehead, MA 01945-1818
(781) 844-2581
reneewhite321@gmail.com

From: Mass Audubon on behalf of Laurie Magee
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:21 PM

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Sincerely,

Ms. Laurie Magee
7 Philip Lane
Foxboro, MA 02035
(508) 498-8536
lauriemagee3@gmail.com

From: Mass Audubon on behalf of Kathleen Wetherby-Zenzie
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:21 PM

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Horseshoe crabs are an important link in the food web of the New England waters. Reducing the number of them harvested will help not just horseshoe crabs but many other species too!

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Wetherby-Zenzie
36 Cross St.
Dover, MA 02030
(508) 320-2791
kwetherby@zenzie.net

From: Mass Audubon on behalf of Brian Walsh
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:20 PM

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Sincerely,

Mr. Brian Walsh
8 Rachael's Ln
Duxbury, MA 01775
(781) 934-1374
brwalsh17@gmail.com

From: Mass Audubon on behalf of susan deane
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:20 PM

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Sincerely,

Ms. susan deane
4 east street
Ipswich, MA 01938
(774) 570-0850
susydeane@yahoo.com

From: Mass Audubon on behalf of Brian Nelson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:20 PM

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Sincerely,

Mr. Brian Nelson
91 Squire LN
Tewksbury, MA 01876
(978) 566-9234
bjnelson62_nojunk@hotmail.com

From: Mass Audubon on behalf of Lisa Horvitz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:20 PM

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Sincerely,

Ms. Lisa Horvitz
7 High Meadow Road
Hadley, MA 01035
(617) 513-1945
lmeadow@duck.com

From: Mass Audubon on behalf of Jane McCafferty
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:20 PM

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Sincerely,

Mrs. Jane McCafferty
38 Hatchet Rock Rd
Scituate, MA 02066
(617) 943-4445
janeturnermccafferty@gmail.com

From: Mass Audubon on behalf of Jody Benjamin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:20 PM

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Sincerely,

Ms. Jody Benjamin
155 Marked Tree Road
Needham, MA 02492
(301) 885-8603
benjafamily@gmail.com

From: Mass Audubon on behalf of Miriam Clifton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:19 PM

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Sincerely,

Mrs. Miriam Clifton
19 Ellis Circle
Weymouth, MA 02190
(781) 335-9535
cliftonmernie@yahoo.com

From: Mass Audubon on behalf of Nathalie Starczak
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:18 PM

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Horseshoe crab eggs are a major food source for fish and migratory birds, including many endangered ones. The adults also serve as prey for conch and sharks. Horseshoe crabs are therefore a crucial part of the food chain. Additionally, their unique blood helps develop drugs.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Nathalie Starczak
52 Harrison Ave
Woburn, MA 01801
(815) 830-5070
starczaknathalie@gmail.com

From: Mass Audubon on behalf of Dan Dick
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:18 PM

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Sincerely,

Mr. Dan Dick
4 Madison St
Natick, MA 01760
(508) 397-9178
dandick@comcast.net

From: Mass Audubon on behalf of john richardson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:18 PM

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Sincerely,

Dr. john richardson
39 white ave
concord, MA 01742
(978) 828-6863
ladybugrichardson@yahoo.com

From:	Mass Audubon on behalf of Karen Hoxie
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Wednesday, February 25, 2026 6:11:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Karen Hoxie
3 Oakwood Rd
Rutland, MA 01543
(978) 790-0071
karenahoxie@gmail.com

From: Mass Audubon on behalf of Michael Peyron
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:17 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Michael Peyron
15 Grimes Street
Boston, MA 02127
(617) 974-0519
mpeyron@hotmail.com

From: Mass Audubon on behalf of Jessica Mohedano
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jessica Mohedano
43 West Summit Street
South Hadley, MA 01075
(413) 454-3104
jesskendall@comcast.net

From: Mass Audubon on behalf of Carla Powdermaker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 6:11:17 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Carla Powdermaker
119 Lincoln Street
Newton Highlands, MA 02461
(617) 953-0717
cpowdermaker@gmail.com

From: Mass Audubon on behalf of Maureen Kelly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:32 PM

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maureen Kelly
85 Rice Rd
Quincy, MA 02170-3515
(617) 721-7739
maureen811@msn.com

From: Mass Audubon on behalf of Patricia Wolongevicz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:24 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Patricia Wolongevicz
88 Havilend St
Wollaston, MA 02339
(617) 773-7915
wolo102@aol.com

From: Mass Audubon on behalf of Janice Barris
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:18 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. I urge you to do the "right" thing for the horseshoe crabs continued existence. They have basically been around for thousands of years and deserve to continue to exist and flourish for future generations to see. Please support to reduce the bait harvest and medical harvest of this iconic animal.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Janice Barris
22 Franklin Street
Braintree, MA 02184
(781) 843-0124
jbarris79@outlook.com

From: Mass Audubon on behalf of Robin Gurdak-Foley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:17 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

These sweet, simple creatures have been walking this Earth since before the dinosaurs. PLEASE do not let humans be their demise! Protect the humble horseshoe crab!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Robin Gurdak-Foley
60 Rantoul Street 708N
Beverly, MA 01915
(413) 530-3101
rgurdakfoley@icloud.com

From: Mass Audubon on behalf of Tricia Patterson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Tricia Patterson
68 Autumn Lane
Lincoln, MA 01773
(817) 992-2121
pattersonovsky@gmail.com

From: Mass Audubon on behalf of Christine Lane
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Christine Lane
19 Windmill Drive
Marlborough, MA 01752
(978) 760-1670
crymsha@gmail.com

From: Mass Audubon on behalf of Michaela Klofac
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Michaela Klofac
200 Liberty Street
Lowell, MA 01851
(617) 515-5670
mkm035@yahoo.com

From: Mass Audubon on behalf of Nandan Naik
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Nandan Naik
7 Winter St.
Salem, MA 01970
(858) 342-3954
naik.nandan@gmail.com

From: Mass Audubon on behalf of Patrick Quinn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Patrick Quinn
78 Addison St
Brockotn, MA 02301
(917) 558-1224
pquinn@me.com

From: Mass Audubon on behalf of Frederick Thurber
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:14 PM

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Stop the horseshoe crab harvest altogether!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Frederick Thurber
219 Horseneck Road
South Dartmouth, MA 02748-1048
(508) 636-3954
frederick.thurber@gmail.com

From: Mass Audubon on behalf of Nancy Ames
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Nancy Ames
11 Wampus Ave 18
Acton, MA 01720
(978) 505-1775
nancyames123@gmail.com

From: Mass Audubon on behalf of Alexandra Tolan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:13 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alexandra Tolan
805 Mt. Auburn Street, Apt. #23
Watertown, MA 02472
(617) 744-0360
at232004@hotmail.com

From: Mass Audubon on behalf of Stefan Sawadsky
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:13 PM

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Dear Mr McKiernan,

I am writing to urge the DMF to adopt the proposed changes to horseshoe crab harvesting regulations. Reducing the bait quota in favor of the biomedical harvest is a common-sense move that will immediately protect 28,000 crabs annually.

However, I view this as a starting point rather than a final solution. The practice of using horseshoe crabs as bait is outdated, and we should be prioritizing the recovery of the species over an unsustainable fishery. Our shorebirds are in a period of rapid decline, and they cannot afford for us to be "middle of the road" on habitat protection. Let's move forward with these regulations and continue working toward restoring the population to its historic levels.

Sincerily,
Stefan Sawadsky
1127 Chestnut St
Newton, MA 02464
sawadsky@hotmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Stefan Sawadsky
1127 Chestnut St
Newton Upper Falls, MA 02464
(404) 547-8367
sawadsky@hotmail.com

From: Mass Audubon on behalf of Paul Domings
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:13 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Paul Domings
3 Great Meadow Rd
Byfield, MA 01922-1614
(978) 289-0763
paul.domings@gmail.com

From: Mass Audubon on behalf of Justin Bernard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:13 PM

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Sincerely,

Mr. Justin Bernard
4 Golden Heights Apt. E
WEBSTER MA, MA 01570
(774) 402-1386
jmb_01550@yahoo.com

From: Mass Audubon on behalf of Janine Hart-Hueber
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:13 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please do the right thing and consider the ecosystem, our environment, and the animals and creatures we are responsible for.
Janine Hart-Hueber
25 Milton Street
Arlington, MA 02474
harthueber@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Janine Hart-Hueber
25 Milton St.
Arlington, MA 02474
(781) 648-3343
harthueber@gmail.com

From: Mass Audubon on behalf of Priscilla Miller
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Priscilla Miller
223 Laws Brook Rd
Concord, MA 01742
(802) 578-1483
pgmil41@yahoo.com

From: Mass Audubon on behalf of Catherine Kroeger
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Plus, horseshoe crabs are valuable in and of themselves, not just as food for birds. As a species that is in great danger, please help to protect them by supporting DMF's proposal!!

This is important to me, as I grew up on the coast back when horseshoe crabs were common.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Catherine Kroeger
47 Old North Rd
Hudson, MA 01749-2807
(978) 555-5555
cat.kroeger.47@gmail.com

From: Mass Audubon on behalf of Valerie Peck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please reduce the annual bait harvest of Horseshoe crabs, these unusual animals are an important part of our ecological system, and serve to help many other species. We must give them a chance to continue their lifestyle as nature intended.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Valerie Peck
7 Washington St
Plymouth, MA 02360-3434
(774) 454-7081
vpeck951@gmail.com

From: Mass Audubon on behalf of Beth Kelly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Beth Kelly

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Beth Kelly
39 white ave
Concord, MA 01752
(978) 857-6442
bkg01@aol.com

From: Mass Audubon on behalf of Kathryn Welteroth
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please help us protect horseshoe crabs from being used as fertilizer. Our state has a long history of protecting wildlife and preserving our eco systems. Let us continue that for even the weirdest of our creatures.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kathryn Welteroth
19 Homestead Road
Middleboro, MA 02346
(570) 898-0666
kwelteroth@gmail.com

From: Mass Audubon on behalf of Kenneth Reeves
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Sincerely,

Dr. Kenneth Reeves
69 Border Road
Concord, MA 01742
(978) 844-8864
ken_reeves@hotmail.com

From: Mass Audubon on behalf of Beth Graham
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Beth Graham
5 Bloomfield Street
Lynn, MA 01902
(609) 706-1197
grahambeth76@gmail.com

From: Mass Audubon on behalf of Deborah Spencer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:54:12 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Deborah Spencer
12 Newport Dr
Billerica, MA 01821
(617) 771-7968
dspencer21661@gmail.com

From: Mass Audubon on behalf of Vicky Sohn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:24 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Vicky Sohn
54 Main St
Vineyard Haven, MA 02568
(860) 887-8102
vickysohn@icloud.com

From: Mass Audubon on behalf of Susan Boudreau
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:23 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Boudreau
716 LaGrange St
West Roxbury, MA 02132-3124
(617) 549-5365
boudsa@comcast.net

From: Mass Audubon on behalf of Ilana Yakubovich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:22 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Ilana Yakubovich
39 Lakeshore Drive
Wayland, MA 01778
(201) 394-8166
ilanaleighsch@gmail.com

From: Mass Audubon on behalf of Cynthia Kinnan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:21 PM

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Horsehoe crabs are amazing creatures and deserve to be protected. What's more, horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As a nature lover and a parent, I urge you to reduce the quota.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Cynthia Kinnan
156 George St
Medford, MA 02155
(617) 412-6337
cynthia.kinnan@tufts.edu

From: Mass Audubon on behalf of Lydia Smith
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lydia Smith
6 2nd Ave
Middleton, MA 01949
(617) 512-3693
silver595@yahoo.com

From: Mass Audubon on behalf of Sarah Hemphill
To: Marine Fish (FWE)
Subject: Please support DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah Hemphill
61 MORSE RD
NEWTON, MA 02460
(617) 733-8559
sthemphill@gmail.com

From: Mass Audubon on behalf of Raymond Traietti
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:19 PM

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Dear Director McKiernan,

As an avid sport fisherman and birdwatcher I believe that to preserve and protect an ecosystem as whole possible is integral to our future. Please approve DMF's horseshoe crab proposal to keep our beautiful New England Coasts sound and healthy.

Sincerely,

Ray Traietti
194 Appleton St
Cambridge, MA 02138
traietti@fas.harvard.edu

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Raymond Traietti
194 Appleton St.
Cambridge, MA 02138
(617) 285-8854
traietti@fas.harvard.edu

From: Mass Audubon on behalf of Sarah Griffith
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:19 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah Griffith
27 Whitney Ave Apt 2
Cambridge, MA 02139
(617) 233-5490
sarahgriffith31@comcast.net

From: Mass Audubon on behalf of Katherine Wheeler
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:19 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds, facing multiple pressures. Let's help them eliminate one of these pressures in Massachusetts. How terrible if shores lack birds.

Medical harvest is unnecessary and OUTDATED now that researchers have developed medications based on similar compounds as those found in horseshoe crabs' blue colored blood. Your vote will give children and grandchildren the chance to be amazed by these living fossils that look like living football helmets. What a shame if beaches are just sand, and if crabs and birds that took hundreds of millions of years to evolve leave us beaches that are bare of all but sand. Nature is our mother, caring for her protects our life in so many ways.

Please consider voting to protect crabs and birds on the beautiful, living shores of Massachusetts.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Katherine Wheeler

72 Rev Nazareno Properzi Way
Somerville, MA 02143
(617) 543-5630
lilawheel@gmail.com

From: Mass Audubon on behalf of Charleen Strelke
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Charleen Strelke
7 Douglas Drive
North Easton, MA 02356
(508) 555-5555
cstrelke@comcast.net

From: Mass Audubon on behalf of Jason Robinson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jason Robinson
120 Whitwell St, 241
Quincy, MA 02169-1998
(508) 887-3926
robinson89j@gmail.com

From: Mass Audubon on behalf of Jerry Grandoni
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:18 PM

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Dear Director McKiernan,

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I am writing in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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I have been a frequent visitor to the shores of Eastham MA for over 50 years and have personally seen the decline in horseshoe crab population. I urge you to please adopt these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Jerry Grandoni
22 Hawthorne Rd
Ashland, MA 01721
grandonij@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jerry Grandoni
22 Hawthorne Road
Ashland, MA 01721
(508) 325-2681
grandonij@gmail.com

From: Mass Audubon on behalf of Nancy Prendergast
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:18 PM

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Feb 25, 2026

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Sincerely,

Mrs. Nancy Prendergast
10 Tupper Rd
Sandwich, MA 02563
(508) 888-6265
prendergastnancy@gmail.com

From: Mass Audubon on behalf of Arleen Teel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Arleen Teel
37 High St Unit 1d
Danvers, MA 01923-3004
(978) 880-0367
arleenteel@gmail.com

From: Mass Audubon on behalf of Anne Grady
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Thank you!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Anne Grady
6 Drury Lane
Natick, MA 01760
(508) 653-7518
nn.grady@gmail.com

From: Mass Audubon on behalf of Elizabeth MacLeod
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:17 PM

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Feb 25, 2026

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I walk the beaches counting these animals make this happen NOW Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Elizabeth MacLeod
534 Winslow Gray Rd
South Yarmouth, MA 02664
(774) 454-6954
lmac5@hotmail.com

From: Mass Audubon on behalf of sara colton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. sara colton
31 shaker house rd.
Sandwich, MA 02563-2335
(508) 888-1234
saraslater1818@aol.com

From: Mass Audubon on behalf of Peggy O"Grady
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:16 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Peggy O'Grady
90 Penni Lane
North Andover, MA 01845
(978) 886-0301
ogradypeggy@gmail.com

From: Mass Audubon on behalf of Judith Gertler
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:16 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. In addition to protecting horseshoe crabs, the proposed regulatory change will protect migratory shorebirds by protecting a food source for these birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Judith Gertler
11 Stanford Road
Wellesley Hills, MA 02481
(781) 626-2501
judy.gertler@gmail.com

From: Mass Audubon on behalf of Martha Wales
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:16 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Martha Wales
11 Tappan St
Manchester-by-the-Sea, MA 01944
(978) 526-7396
martharwales@gmail.com

From: Mass Audubon on behalf of Emilie Brush
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Emilie Brush
25 Bryant Lane
Tyngsborough, MA 01879
(978) 649-2300
ebrush@tyngsboroughma.gov

From: Mass Audubon on behalf of Diana Raphael
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Diana Raphael
15 Royal Way
Dartmouth, MA 02748
(774) 510-5784
diana.raphael7@gmail.com

From: Mass Audubon on behalf of Andrea Doukas
To: Marine Fish (FWE)
Subject: Approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Andrea Doukas
168 Coolidge Street
Brookline, MA 02446-5859
(617) 739-8808
avdoukas@hotmail.com

From: Mass Audubon on behalf of Monica Mackey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:15 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Yet these birds, and the waters that support them, are among the chief tourist attractions of Massachusetts. I see this where I live on Cape Cod, especially in Wellfleet. People from all over the globe come to Cape Cod for their vacations, and and many will eventually purchase a home for seasonal or year-round residency. This brings in tax-revenue, business income, and builds a resilient economy based on our legendary natural beauty.

The Horseshoe crabs are essential for the success of our shorebirds, and ultimately our natural attractions - which are vital to the Masschusetts economy.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Monica Mackey
155 Nauhaught Bluffs
Wellfleet, MA 02667

(415) 505-4952
monica.mackey@gmail.com

From: Mass Audubon on behalf of Shawn Vallereux
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:14 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Shawn Vallereux
23 Hasenfus Cir
Needham Heights, MA 02494
(978) 729-8740
shawnvall@gmail.com

From: Mass Audubon on behalf of Lauren McKean
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:14 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

On Cape Cod this is a very important species!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lauren McKean
PO Box 4
South Wellfleet, MA 02663
(508) 237-0654
laurenmckean508@gmail.com

From: Mass Audubon on behalf of Emma Puhalski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:14 PM

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Feb 25, 2026

Director Daniel McKiernan

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are some of the most unchanged and ancient arthropods and are considered "living fossils". Destroying such a unique and long lived species would be a devastating blow to the natural history of the planet.
Additionally, Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds and protecting these vulnerable species protects critical ecosystems as a whole.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Emma Puhalski
22 Cooper Street Apt 2
Boston, MA 02113
(413) 505-7271
emnpuhalski3@gmail.com

From: Mass Audubon on behalf of Bryan Lorber
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Bryan Lorber
1072 South East Street
Amherst, MA 01002
(401) 829-8375
brylorbs@gmail.com

From: Mass Audubon on behalf of KRISTEN KLEIMAN
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:41:14 PM

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I have volunteered to monitor horseshoe crab populations and it is clear they are in vastly diminished numbers since I was a child (50 years ago). Horseshoe crabs aren't a throw-away species: they provide food for many species and have survived for millions of years. They should be protected.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. KRISTEN KLEIMAN
30 Chapel Street
Duxbury, MA 02332
(617) 797-9670
kkleiman99@gmail.com

From: Mass Audubon on behalf of Isaiah Plovnick
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:22 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Isaiah Plovnick
263 Walnut Street
Brookline, MA 02445
(617) 872-2835
stagethane@gmail.com

From: Mass Audubon on behalf of Cindy Babaian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:21 PM

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Sincerely,

Ms. Cindy Babaian
88 Tremont Street
Braintree, MA 02184
(781) 267-1308
stinger.apples_0f@icloud.com

From: Mass Audubon on behalf of Corey Monteiro
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:20 PM

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Sincerely,

Mr. Corey Monteiro
1461 VFW PKWY
Boston, MA 02132
(401) 585-6660
comont24@gmail.com

From: Mass Audubon on behalf of Diane Kolakoski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Diane Kolakoski
55 North Hillside Rd
Deerfield, MA 01373
(413) 475-2967
dlkolakoski@gmail.com

From: Mass Audubon on behalf of Peter Gow
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:19 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I have long known of and appreciated the reality that Limulus Polyphemus, a near-dinosaur, is not just a marvelous creature but also a critical part of the natural ecosystem above and beyond its importance in medical research. But let it be noted that, as "lab animals" living in their natural habitats, horseshoe crabs have contributed to the saving of countless human lives.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Peter Gow
32 Worthington St.
Dedham, MA 02026
(781) 249-0988

pegow3@gmail.com

From: Mass Audubon on behalf of Stephanie Kowalski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:19 PM

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As a Massachusetts Audubon volunteer, I have participated in horseshoe crab count. The numbers have been low. Please try to restore them to their previous numbers.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Stephanie Kowalski
10 Rocky Ridge Cir
Taunton, MA 02780
(508) 345-5426
skowalski21@gmail.com

From: Mass Audubon on behalf of Delia Byrnes
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:19 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

THEY ARE SO IMPORTANT PLEASE LET THEM BE TREATED SPECIAL

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Delia Byrnes
5 Maple Place
Plymouth, MA 02360
(860) 514-9113
classicdm@aol.com

From: Mass Audubon on behalf of Mary Ann Pappanikou
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Ann Pappanikou
118 Loring Rd
Weston, MA 02493-2451
(781) 891-8035
mannpap@hotmail.com

From: Mass Audubon on behalf of Elizabeth Merrick
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Elizabeth Merrick
967 Broadway
Somerville, MA 02144
(857) 523-5944
ebm333@comcast.net

From: Mass Audubon on behalf of ELIZABETH CANTOR
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. I had the pleasure of seeing some of them on Martha's Vineyard this summer, and I'd love for future generations to continue seeing them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. ELIZABETH CANTOR
31 Rossmore St, Apt 3
Somerville, MA 02143-3103
(323) 599-6808
lizzcantor@gmail.com

From: Mass Audubon on behalf of Brenda Swithenbank
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. This mandate should be extended throughout the coast to insure the continued viability of this species for the long term and not for a short term economic gain for the few.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Brenda Swithenbank
43 Dexter's Mill Drive
Teaticket, MA 02536-5830
(508) 457-1714
bswithenbank@comcast.net

From: Mass Audubon on behalf of Kathleen O"Connell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:17 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Horseshoe crabs are one of the oldest species left on the planet. let's not be the generation that sees them go extinct!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen O'Connell
4 Cedar Dr
Canton, MA 02021
(978) 302-8103
koconnell285@gmail.com

From: Mass Audubon on behalf of Ilene Segal
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Ilene Segal
245 Warren Drive
Norfolk, MA 02056
(617) 519-9268
ihsdvm6@gmail.com

From: Mass Audubon on behalf of Lorraine Gray
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Lorraine Gray
16 Symmes Street
Roslindale, MA 02131-1649
(617) 816-4587
llgray@umich.edu

From: Mass Audubon on behalf of Lucille Weinstein
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:17 PM

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I frequently walk along the ocean beaches, and love to see horseshoe crabs. Their eggs are very important for migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Lucille Weinstein
4 Chestnut Ln
Bedford, MA 01730-1052
(516) 680-5616
lucyw9130@gmail.com

From: Mass Audubon on behalf of Kimberly Coale
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:16 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kimberly Coale
16 Shamrock Street
Worcester, MA 01605
(774) 364-3153
kimberly.coale@gmail.com

From: Mass Audubon on behalf of Shannon Griffin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:15 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Shannon Griffin
32 Greylock Rd
Cheshire, MA 01225
(413) 743-7759
smgriffin77@icloud.com

From: Mass Audubon on behalf of Ken Jackson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:15 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I used to regularly see Horseshoe crabs in the shallows of Pavilion Beach in Ipswich. Now one is a rare event. This proposal is a step toward the population recovery. Better would be to also eliminate the harvest by the pharmaceutical industry. There are alternatives.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ken Jackson
7 Wainwright St
Ipswich, MA 01938-1335
(978) 500-3531
ken.jackson2@gmail.com

From: Mass Audubon on behalf of Julia Rinehart
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:15 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. They are also my favorite to see at the beach and an integral part of New England.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Julia Rinehart
41 Garfield Ave
Medford, MA 02155
(952) 237-4734
julia.b.rinehart@gmail.com

From: Mass Audubon on behalf of Stephen Murphy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:15 PM

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Sincerely,

Mr. Stephen Murphy
43 Davis Street
Northborough, MA 01532
(508) 317-8443
stephenmurphy1@msn.com

From: Mass Audubon on behalf of Isabel Hanekamp
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:14 PM

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Sincerely,

Mrs. Isabel Hanekamp
4 Judith Rd
Wilmington, MA 01887-4007
(617) 710-9396
imhanekamp@post.harvard.edu

From: Mass Audubon on behalf of John Carew
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:14 PM

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Sincerely,

Mr. John Carew
143 richmond ave
Worcester, MA 01602
(508) 769-9071
carewj60@gmail.com

From: Mass Audubon on behalf of Cheryl Eggert
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:14 PM

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Sincerely,

Ms. Cheryl Eggert
225 Lincoln Rd
Phillipston, MA 01331-9777
(978) 249-9231
bailey978@protonmail.com

From: Mass Audubon on behalf of Sabina Keif
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:14 PM

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Sincerely,

Dr. Sabina Keif
25 BV French Street
Braintree, MA 02184
(716) 698-9755
sabina.keif@gmail.com

From: Mass Audubon on behalf of Sheila Enright
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:14 PM

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Sincerely,

Ms. Sheila Enright
18 Upcrest Rd
Brighton, MA 02135
(617) 519-6989
senright58@gmail.com

From: Mass Audubon on behalf of Rose Herrmann
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:13 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. It is absolutely horrendous that so many horseshoe crabs are murdered for bait and for blood letting. ELI Lilly has shown they are good stewards of the environment by transitioning to synthetic alternatives and are already using 80% synthetics. There is NO reason why Charles River laboratories and Associates of Cape Cod can't do the same as it is absolutely despicable. Horseshoe crab numbers have declined horrendously

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Rose Herrmann
10 Newton
Northborough, MA 01532
(508) 451-7938
rose.herrmann6@icloud.com

From: Mass Audubon on behalf of Sarah McClellan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:13 PM

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Do the right thing and give protection to these ancient creatures!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah McClellan
34 Richdale Ave
Somerville, MA 02145-3716
(857) 523-8780
smcclellan34@gmail.com

From: Mass Audubon on behalf of Paul Green
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Paul Green
18 Fairview Ave
Arlington, MA 02474
(781) 721-4355
pauljgreen1@gmail.com

From: Mass Audubon on behalf of Judith Robichaud
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:12 PM

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Sincerely,

Ms. Judith Robichaud
38 Ardale St
Roslindale, MA 02131
(617) 325-9908
juder811@gmail.com

From: Mass Audubon on behalf of Eileen Prefontaine
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:12 PM

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Sincerely,

Ms. Eileen Prefontaine
19 Maple St.
Hopkinton, MA 01748
(978) 809-1408
elprefon@verizon.net

From: Mass Audubon on behalf of Ellen Snoeyenbos
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:12 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ellen Snoeyenbos
106 South Street
Halifax, MA 02338
(781) 789-2517
esnoeyen8@gmail.com

From: Mass Audubon on behalf of Ellen Godena
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:12 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Ellen Godena
40 Harlow Street
Arlington, MA 02474
(617) 407-2333
egodena@gmail.com

From: Mass Audubon on behalf of Charlo Maurer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:12 PM

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I truly hope that something can be done to save more of our special horse shoe crabs. There used to be so many more on the Cape in the past. Now I rarely see a live one.
Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Charlo Maurer
5 Appleton St
Watertown, MA 02472
(617) 372-4156
charlojmaurer@gmail.com

From: Mass Audubon on behalf of Cara Sanford
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:11 PM

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This planet is losing its biodiversity and it's so disturbing to me personally. Isnt' there a way for mankind to live in balance with Nature? Cara Sanford, Lancaster, MA

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cara Sanford
350 Bull Hill Rd
Lancaster, MA 01523-2109
(978) 270-7694
carasanford@comcast.net

From: Mass Audubon on behalf of Frank Silagy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:11 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Frank Silagy
190 Spring Road
Eastham, MA 02642
(917) 733-5492
franksilagy@gmail.com

From: Mass Audubon on behalf of Harvey Halpern
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:11 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Harvey Halpern
73 Tremont St
Cambridge, MA 02139-1345
(617) 876-1345
hhalpern1@gmail.com

From: Mass Audubon on behalf of Donald Henrich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:11 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Donald Henrich
11 Glen Rd
Dedham, MA 02026
(781) 381-2444
uechenrich@yahoo.com

From: Mass Audubon on behalf of Judith Nardacci
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:10 PM

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Horseshoe crab eggs are an important food for global migratory birds; rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Increasing and maintaining sufficient populations to feed shorebirds will help sustain the populations of some of the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Judith Nardacci
29 Stringer Avenue
Lee, MA 01238-9402
(413) 243-2382
mssenn29@gmail.com

From: Mass Audubon on behalf of JEFFREY CONLON
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:24:10 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. JEFFREY CONLON
58 Brantwood Rd
Worcester, MA 01602-1745
(508) 826-0447
nowisee543@gmail.com

From: Mass Audubon on behalf of Richard Chandler
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:25 PM

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Using Horseshoe Crabs for bait makes little sense as they decline in overall numbers. Let's not be the generation that destroys a last remnant of one of the oldest ecological lineages. I do support continued harvest for medical purposes, but would like to see that managed in a way that doesn't further deplete the species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Richard Chandler
PO Box 2011
Ashfield, MA 01330
(413) 325-4411
glaciermeadow@gmail.com

From: Mass Audubon on behalf of Linda Pulaski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:24 PM

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My grand kids have been very concerned about preserving the horseshoe crabs on Cape Cod. They have been learning about them since they were very little and are even more concerned 14 years later! They told me to ask: Isn't there something that isn't "pre-historic" that can be used for bait? And I am adding: for Heaven's sake!?

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Linda Pulaski
86 Kates Path
Yarmouth Port, MA 02675
(602) 717-3319
clpulaski@icloud.com

From: Mass Audubon on behalf of William Ribich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:24 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. William Ribich
215 Scraggy Neck Road
Cataumet, MA 02534
(617) 775-6113
wcribich@comcast.net

From: Mass Audubon on behalf of Barbara Bates
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:23 PM

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Sincerely,

Ms. Barbara Bates
298 Cypress Street
Newton Centre, MA 02459
(617) 964-6119
b.l.bates@rcn.com

From: Mass Audubon on behalf of Clara Van De Water
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:23 PM

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Sincerely,

Mrs. Clara Van De Water
26 Heirs Lndg
South Dennis, MA 02660-3512
(508) 694-7538
cbvandewater@gmail.com

From: Mass Audubon on behalf of Lisa Aubin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:23 PM

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My mother lived on the Cape for decades and so I have made countless trips to walk the beaches there and have memories of seeing so many horseshoe crabs in the sand! But now I am very aware how important they are to the food web and our local ecosystems.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lisa Aubin
52 Moore Road
Wayland, MA 01778
(617) 233-1659
lisamarieaubin@gmail.com

From: Mass Audubon on behalf of Brian Radzwill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:22 PM

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Sincerely,

Mr. Brian Radzwill
19 Lyman Rd
Framingham, MA 01701
(508) 788-6059
bradzwill@gmail.com

From: Mass Audubon on behalf of Kelly Wennik
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:22 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As stewards of this planet it is up to us to protect our ecosystems for our own health, and the well being our of planet.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kelly Wennik
134 Reed Farm Rd
Boxborough, MA 01719
(978) 289-0218
kelly.wennik@me.com

From: Mass Audubon on behalf of Nicole Kopaczewski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:22 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Nicole Kopaczewski
22 Beechwood Drive
South Dartmouth, MA 02748
(508) 441-7743
nicolebea@gmail.com

From: Mass Audubon on behalf of Pixie Medeiros
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Pixie Medeiros
1974 Main Road. PO Box #6
Westport, MA 02791
(610) 442-7108
ultimateretailtherapy@gmail.com

From: Mass Audubon on behalf of Annalisa Tornberg
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Annalisa Tornberg
128 Leonard St
Gloucester, MA 01930
(508) 828-0080
annalisa228@comcast.net

From: Mass Audubon on behalf of donna sullivan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:21 PM

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I have seen the number of horseshoe crabs decline over the years on Cape Cod as I have been walking the beaches. We need to protect them from harm or death due this blood leading process,. There are other ways to create the necessary medications that humans need without harming the horseshoe crabs.

We have the technology to do it so let's use it.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. donna sullivan
7 east main street
brookfield, MA 01506
(508) 344-0078
sully-3@charter.net

From: Mass Audubon on behalf of Dawn Voorhees
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Dawn Voorhees
44 Washington St
Newburyport, MA 01950
(978) 499-2153
2centsplus@gmail.com

From: Mass Audubon on behalf of Susan Littlefield
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Susan Littlefield
PO Box 409
Cummaquid, MA 02637-0409
(508) 362-2363
sshlittlefield@gmail.com

From: Mass Audubon on behalf of Leah Gillis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Leah Gillis
7 Blair Ter
Peabody, MA 01960-5105
(978) 239-6754
leahgriff@verizon.net

From: Mass Audubon on behalf of Janet Bissell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:20 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Janet Bissell
36 Maynard rd
Northampton, MA 01060
(413) 586-5488
janetbissell@yahoo.com

From: Mass Audubon on behalf of Cynthia Nolan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:20 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Please do not allow these magnificent, historic animals to be used as bait in conch fishery. Stop this practice now!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cynthia Nolan
21 Crosby St
Northampton, MA 01060
(413) 523-2962
cynthianolan01@gmail.com

From: Mass Audubon on behalf of Matthew Cote
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Matthew Cote
201 College ave
Waltham, MA 02452
(978) 424-5701
mtthw.cote@gmail.com

From: Mass Audubon on behalf of Gail Boyajian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:18 PM

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Horseshoe crab eggs are a crucial food resource for global migratory birds, such as the threatened Red Knot which migrates extreme distances. They have been seen feeding on the crab eggs in places where harvesting the crabs is forbidden.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Gail Boyajian
174 Lexington Ave
Cambridge, MA 02138-3368
(617) 492-1577
gailboyajian@gmail.com

From: Mass Audubon on behalf of Igor Zlokarnik
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Igor Zlokarnik
24 Emerson St
Natick, MA 01760-1819
(508) 314-0559
zlokarnik@gmail.com

From: Mass Audubon on behalf of Heidi Finnegan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining groups of birds. It is essential that their food supply is not impacted.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Heidi Finnegan
10 Spruce Circle
Hopedale, MA 01747
(774) 573-7473
finneganh1984@gmail.com

From: Mass Audubon on behalf of Lorene Sweeney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:18 PM

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Sincerely,

Ms. Lorene Sweeney
43 Russells Mills Rd
Dartmouth, MA 02748
(508) 542-4350
keltill@gmail.com

From: Mass Audubon on behalf of Kimberly Snyder
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kimberly Snyder
180 Main Street
Bridgewater, MA 02324
(914) 886-2137
kcsnyder011@gmail.com

From: Mass Audubon on behalf of Charles Resevick
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:17 PM

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Sincerely,

Mr. Charles Resevick
4 Eighth Green Drive
Dartmouth, MA 02747
(774) 930-3898
cresevick@gmail.com

From: Mass Audubon on behalf of Carol Tinkham
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:17 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
This is a start, but eventually the biomedical industry should also be forbidden from taking them, as well. There are other ways of testing without using these animals.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Carol Tinkham
321 Head of the Bay Road
Buzzards Bay, MA 02532
(508) 759-9162
caroltinkham@gmail.com

From:	Mass Audubon on behalf of Janet Miller
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Wednesday, February 25, 2026 5:11:17 PM

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Sincerely,

Dr. Janet Miller
1647 Main St
Concord, MA 01742
(978) 610-2524
jcm02129@mac.com

From: Mass Audubon on behalf of Nicole Mordecai
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:17 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I have personally witnessed the drastic decline in horseshoe crabs since my childhood. Please act to protect this important species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Nicole Mordecai
135 Conant Road
Weston, MA 02493
(781) 248-7515
nicole@mordecai.ws

From: Mass Audubon on behalf of Tess Connor
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Sincerely,

Miss Tess Connor
44 Prospect St
Stoughton, MA 02072-4154
(781) 307-8721
teconnor38@gmail.com

From: Mass Audubon on behalf of Megan Burns
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Sincerely,

Mrs. Megan Burns
52 Mill St
Sherborn, MA 01770
(617) 571-4003
mbburns9@gmail.com

From: Mass Audubon on behalf of Craig Thomas
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Sincerely,

Mr. Craig Thomas
305 Dutton St, Unit 517
Lowell, MA 01854
(617) 763-0223
cetbvc@gmail.com

From: Mass Audubon on behalf of Mary Langner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Mary Langner
29 Quail Run
Duxbury, MA 02332
(781) 812-6889
marylangner77@gmail.com

From: Mass Audubon on behalf of Sharon Bauer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sharon Bauer
62 Pearl Street
Watertown, MA 02472
(617) 924-8022
sharonkaybauer@gmail.com

From: Mass Audubon on behalf of Jeanna Kinnebrew
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Jeanna Kinnebrew
50 Kent St #3A
Brookline, MA 02445
(615) 293-8232
jeanna.kinnebrew@gmail.com

From: Mass Audubon on behalf of carolyn parker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds

In the past few years I have noticed a marked decrease in crabs near our beach and in the Pleasant Bay Area.
Does any helpless animal deserve to be bled to death and used for bait? Alternatives are available for the biomedical companies. God knows they can afford to use them!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. carolyn parker
224 cranberry ln
N. Chatham, MA 02650
(208) 481-0785
carolynparker2@gmail.com

From: Mass Audubon on behalf of Michelle Cutlip
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:16 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Michelle Cutlip
1 fairview st
North reading, MA 01864
(978) 430-7168
michellec62@hotmail.com

From: Mass Audubon on behalf of Amanda Hsiao
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:14 PM

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Sincerely,

Ms. Amanda Hsiao
2 Garfield Street
Natick, MA 01760
(734) 717-3191
amandahsiao123@gmail.com

From: Mass Audubon on behalf of Elizabeth DeVasher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:14 PM

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Sincerely,

Mrs. Elizabeth DeVasher
60 New Driftway
Scituate, MA 02066
(781) 378-2251
jdevasher@comcast.net

From: Mass Audubon on behalf of Harriet Forman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:14 PM

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Sincerely,

Ms. Harriet Forman
381 Pollard Road
Northbridge, MA 01534
(508) 579-8758
harrietf@charter.net

From: Mass Audubon on behalf of Celeste Palladino
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Celeste Palladino
29 Landy Ave
Florence, MA 01062
(413) 362-6163
celestepalladino@gmail.com

From: Mass Audubon on behalf of Deirdre Morris
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Deirdre Morris
39 Russell Street
Medford, MA 02155
(781) 391-1696
kittyhawk12348@earthlink.net

From: Mass Audubon on behalf of Brenda Barry
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:13 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Brenda Barry
214 Bishops Forest Drive
Waltham, MA 02452
(617) 721-4663
bebarry@comcast.net

From: Mass Audubon on behalf of Elizabeth Aghajanian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:13 PM

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Sincerely,

Ms. Elizabeth Aghajanian
117 Burlington Street
Lexington, MA 02420
(781) 862-3274
lisa.aghajanian@gmail.com

From: Mass Audubon on behalf of Liz Davidson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:13 PM

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Sincerely,

Ms. Liz Davidson
163 Farm St
Blackstone, MA 01504
(508) 247-7265
sbean27@proton.me

From: Mass Audubon on behalf of Tamara Hammer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:13 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Tamara Hammer
65 E India Row
Boston, MA 02210
(617) 851-9832
hammer.tamara.s@gmail.com

From: Mass Audubon on behalf of Tammy Nohelty
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:13 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Dear Director McKiernan,

I am writing to strongly support the DMF proposal to limit the annual bait harvest of horseshoe crabs. Saving an estimated 28,000 horseshoe crabs per year is a meaningful and necessary step. However, I urge the state to move more decisively toward phasing out the unnecessary and unsustainable bait harvest altogether, while encouraging the biomedical industry to accelerate its transition to effective synthetic alternatives.

Horseshoe crab eggs are a vital food source for global migratory birds. Rare shorebirds have been documented feeding on these eggs at Monomoy, where horseshoe crab harvest is prohibited -- a clear indication of the ecological importance of protecting these populations. Shorebirds are among the most rapidly declining groups of birds worldwide, and continued pressure on horseshoe crabs only compounds this crisis.

Massachusetts has an opportunity to demonstrate strong environmental leadership by taking meaningful action now. I respectfully urge you to adopt the proposed limits and to continue advancing policies that ensure the long-term protection of horseshoe crabs and the species that depend on them.

Thank you for your time and consideration.

Sincerely,

Tammy Nohelty
34 Old Planters Road
Beverly, MA 01915
Noheltyart@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Tammy Nohelty
34 Old Planters Road
Beverly, MA 01915-1552
(617) 901-8985
noheltyart@gmail.com

From: Mass Audubon on behalf of Carol Craig
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:12 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Carol Craig
5 Harvest Hollow Dr
Harwich Port, MA 02646
(321) 961-0848
radcc23@hotmail.com

From: Mass Audubon on behalf of Kimberlee Trudeau
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 5:11:12 PM

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Please do the best you can to support nature!

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Kimberlee Trudeau
53 Helen Road
Needham, MA 02492
(917) 538-1144
kimberleetrudeau@yahoo.com

From: Mass Audubon on behalf of Robert Mitchell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:26 PM

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Feb 25, 2026

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Sincerely,

Mr. Robert Mitchell
6 Spaulding Street
Wakefield, MA 01880-1636
(781) 724-8913
robertwmitchell@verizon.net

From: Mass Audubon on behalf of Elaine Stone
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:26 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Saving these crabs will help with saving the birds that depend upon them as they migrate.

Horseshoe crabs have inhabited Massachusetts waters for untold thousands of years. They have inhabited Earth's oceans for hundreds of millions of years. I believe we should honor this endurance, particularly in a species from which we already have taken so much.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elaine Stone
65 Harrison St
Reading, MA 01867-2646
(781) 315-2926
lestone@comcast.net

From: Mass Audubon on behalf of Kim Bocchino
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:25 PM

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Sincerely,

Ms. Kim Bocchino
82 Fairmount Ave
Saugus, MA 01906
(781) 520-0362
kimbocchino9968@yahoo.com

From: Mass Audubon on behalf of Mihail Bancu
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:25 PM

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Sincerely,

Dr. Mihail Bancu
159 Grove St
Melros, MA 02176
(617) 448-4276
bancum@yahoo.com

From: Mass Audubon on behalf of Lisa Smith
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:24 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lisa Smith
44 Haven Terrace
Gloucester, MA 01930-3020
(508) 488-7666
lisajsmith3000@gmail.com

From: Mass Audubon on behalf of Jane Moosbruker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:24 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Sincerely,

Dr. Jane Moosbruker
40 Brewster Lane
Acton, MA 01720
(978) 263-7193
jmoosbruker@gmail.com

From: Mass Audubon on behalf of Charlotte Hamlin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:23 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Charlotte Hamlin
428 Potomska Road
South Dartmouth, MA 02748
(508) 415-1204
still.oarlock@gmail.com

From: Mass Audubon on behalf of Joseph Moore
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:22 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Joseph Moore
22 Marion Rd
Arlington, MA 02474
(339) 225-1898
relief11@verizon.net

From: Mass Audubon on behalf of April Hill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:22 PM

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Feb 25, 2026

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Sounds like a win-win for science and the species!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. April Hill
39 Shore Drive
Kingston, MA 02364
(413) 531-5657
ajmorin@gmail.com

From: Mass Audubon on behalf of liz zobel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:22 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. liz zobel
111 Perkins st
Boston, MA 02130
(617) 694-6341
lizzobel@gmail.com

From: Mass Audubon on behalf of Varounny Chanthasiri
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:21 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Varounny Chanthasiri
9 Phillips St
Beverly, MA 01915
(917) 623-1758
varounny@gmail.com

From: Mass Audubon on behalf of Lisa Honeyman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:21 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Lisa Honeyman
219 Walnut Street
Wellesley, MA 02481
(781) 235-7907
fthoneyman@gmail.com

From:	Mass Audubon on behalf of Emme Carroll
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Wednesday, February 25, 2026 4:54:21 PM

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Feb 25, 2026

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Horseshoe crabs are an iconic and prehistoric species that serve as a lynchpin for biodiverse marine ecosystems, and their eggs are a crucial resource for global migratory birds. Massachusetts allows them to be harvested for bait, despite populations that have not recovered to historic levels.

The state is proposing new rules that would reduce the number of horseshoe crabs that can be fished for bait, as well as reducing the biomedical industry's reliance on the bait harvest. The animals bled for the biomedical industry are returned to the water, and while there is some mortality, this is much less than the 100% loss of crabs harvested for bait.

Division of Marine Fisheries (DMF) Director Dan McKiernan proposed to lower the bait harvest quota from 140,000 crabs per year to 100,000 crabs per year and proposed to increase the biomedical harvest quota from 200,000 crabs per year, to 280,000 crabs per year.

Assuming a 15% mortality rate for crabs caught for bleeding, this would result in a net decrease in horseshoe crab mortality of at least 28,000 crabs.

Additionally, the proposal is specifically designed to decrease the biomedical industry's reliance on bait catch, tempering an important driver of demand for that fishery. There is no regulatory path forward to ending the bait harvest in Massachusetts that doesn't address short

term demand from the low-mortality biomedical fishery. The product they make is still in high demand by drug and medical equipment manufacturers.

Director McKiernan's memo points out that if we want to manage horseshoe crabs for abundance, then the focus should be on mortality, and not strictly on harvest catch limits.

While this is a step in the right direction, the state should move decisively toward phasing out the unnecessary and unsustainable bait harvest and the biomedical industry should transition to use of synthetic alternatives.

The best way to end using horseshoe crabs as bait entirely is to take an approach that prioritizes winding down the bait fishery.

DMF's proposed quota reallocation embraces that approach, reducing the allowable catch by nearly 30% for an industry in which every animal that is caught dies.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Emme Carroll
Peaked hill road
Chilmark, MA 02535
(508) 939-0732
ecarroll28@falmouthacademy.org

From: Mass Audubon on behalf of Jessica LeGault
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:20 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jessica LeGault
109 Wright St
Arlington, MA 02474
(413) 537-4143
jchoquette27@hotmail.com

From: Mass Audubon on behalf of Wendy Dwinells
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:19 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As a citizen scientist working as a volunteer at Cape Cod Museum of Natural History I have learned the importance of these animals in our Cape Cod environment and want them to be here as a healthy population for decades to come. Only change can make this possible.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Wendy Dwinells
382 Pleasant Bay rd
Harwich, MA 02645
(978) 660-3392
wdwinells1@comcast.net

From: Mass Audubon on behalf of Julia McMahon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Julia McMahon
45 Pooles Ln
Rockport, MA 01966
(978) 546-6425
jpmcmahon@verizon.net

From: Mass Audubon on behalf of Alexander Shafer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:19 PM

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Feb 25, 2026

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Horseshoe crabs as particularly meaningful to me as I remember fishing the coast with my father and seeing crabs all over the place during their mating season and understand how important they are to the ecosystem. Their habitat is constantly under threat of development and human interference which makes regulation like this, to protect their numbers, all the more important.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Alexander Shafer
348 Neponset St, Apt E
Canton, MA 02021
(203) 470-3167
augshark@yahoo.com

From: Mass Audubon on behalf of Sheri Boyle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sheri Boyle
26 Seabury Ln
Westport, MA 02790
(508) 916-7683
boylesheri@msn.com

From: Mass Audubon on behalf of Kathleen Lewis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:19 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Kathleen Lewis
250 Furnace Brook Pkwy
Quincy, MA 02169-2274
(617) 847-8941
katcat108@netzero.net

From: Mass Audubon on behalf of Frank Ribeiro
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:18 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
In my experience it appears on so many fronts our exploitation of our natural resources continues to overwhelm our natural environment. It saddens me to no end...
Please do the right thing and put your stamp of approval on the DMF's HORSESHOE CRAB proposal.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Frank Ribeiro
8 Hoe Shop Road
Bernardston, MA 01337
(413) 522-1619
8hoeshop@comcast.net

From: Mass Audubon on behalf of Zinnia Gutowski
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:18 PM

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Sincerely,

Mrs. Zinnia Gutowski
117 Crescent Lane
Brewster, MA 02631
(845) 401-7241
z_gutowski@yahoo.com

From: Mass Audubon on behalf of Robert Hutchinson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:18 PM

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Sincerely,

Mr. Robert Hutchinson
P.O. Box 742
Hyannis Port, MA 02647
(508) 775-7576
nettie1873@gmail.com

From: Mass Audubon on behalf of PAMELA J. SMITH
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:18 PM

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Sincerely,

Ms. PAMELA J. SMITH
84 Attucks Trail
Chatham, MA 02633
(617) 333-6898
pjsmith2020@comcast.net

From: Mass Audubon on behalf of Kathleen Emrich
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:17 PM

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This proposal is a reasonable first step to restoring this unique species, which is integral to the food chain of migrating shorebirds and performs other ecological services in coastal waters. The species could be seen on many beaches only 50 years ago; now it is rare. Such over-utilization of a species is not the kind of environmental legacy that Massachusetts should support.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Emrich
505 Tremont Street
Boston, MA 02116
(617) 513-6482
kje02116@gmail.com

From: Mass Audubon on behalf of Alison Thompson Calandra
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:17 PM

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Sincerely,

Mrs. Alison Thompson Calandra
111 Audubon Drive
Acton, MA 01720
(978) 998-2789
white.thistle@gmail.com

From: Mass Audubon on behalf of Ruth Lawrence
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:17 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Ruth Lawrence
7 DEWEY AVE
MILLBURY, MA 01527
(508) 865-9015
ruth.e.lawrence52@gmail.com

From: Mass Audubon on behalf of Rob Meyer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:17 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

In addition, horseshoe crabs are one of the only animals I know of that provide a rare glimpse into our prehistoric past. I've loved teaching about them to my children and grandchildren in real time, watching them bury themselves in the sandy shallows of Cape Cod. They are a natural treasure!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Rob Meyer
1264 Beacon Street, Apt. 2
Brookline, MA 02446
(781) 799-8229
meyer75@comcast.net

From: Mass Audubon on behalf of Donald LaLiberte
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:16 PM

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Donald LaLiberte
772 Berkley Street
Berkley, MA 02779-1907
(617) 899-7692
donald.laliberte@gmail.com

From: Mass Audubon on behalf of Patricia Cantor Petrucelly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:16 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Patricia Cantor Petrucelly
17 Kenwood St
Cambridge, MA 02139
(617) 354-1626
jeffpat17@msn.com

From: Mass Audubon on behalf of Peter Bray
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:16 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Peter Bray
65 Lawrence Ave
New Marlborough, MA 01230
(718) 638-2609
pbparkslope@gmail.com

From: Mass Audubon on behalf of Phyllis Pollack
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:16 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I urge to join other states in protecting this ancient species that is so important to a healthy ecosystem and biodiversity.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Phyllis Pollack
9 Tideswell Ln
Worcester, MA 01609-4402
(508) 849-9777
phyl.pollack@gmail.com

From: Mass Audubon on behalf of Harold Robertson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:15 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Harold Robertson
41 Fisher Road
Westport, MA 02790
(617) 838-9633
h.rob.esq@icloud.com

From: Mass Audubon on behalf of David Taberner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:15 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Taberner
30 Waldo Road
Arlington, MA 02474-5518
(774) 364-3152
dtaberner@gmail.com

From: Mass Audubon on behalf of Cat Dossett
To: Marine Fish (FWE)
Subject: URGENT: Approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:15 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Moreover, horseshoe crabs are amazing in their own right as living fossils on our beaches. They have survived five mass extinctions! At a time when species are decimated by human overhunting, etc., it is vastly important that horseshoe crabs do not disappear alongside them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Cat Dossett
63 Bourne Street
Newton, MA 02466
(617) 838-4069
dossettcat@gmail.com

From: Mass Audubon on behalf of Laura Vidale
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:15 PM

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Sincerely,

Ms. Laura Vidale
180 High Street
Pittsfield, MA 01201
(617) 893-0776
ltvidale@gmail.com

From: Mass Audubon on behalf of Elizabeth SEELMAN
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth SEELMAN
25 Richard Ave
Cambridge, MA 02140
(617) 661-3644
liz.seelman@gmail.com

From: Mass Audubon on behalf of Elizabeth Yon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Yon
484 Winter Street
Holliston, MA 01746
(508) 429-2304
libby.yon50@gmail.com

From: Mass Audubon on behalf of Roy Wilsker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Roy Wilsker
183 Valley Road
Needham, MA 02492
(617) 852-6531
rwilsker@gmail.com

From: Mass Audubon on behalf of JULIE Giganti-Almeida
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. JULIE Giganti-Almeida
90 CARRINGTON LN
UXBRIDGE, MA 01569
(617) 694-2057
giganti.j@gmail.com

From: Mass Audubon on behalf of Jeanne Andersen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:14 PM

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Sincerely,

Dr. Jeanne Andersen
35 Cushing St
Cambridge, MA 02138
(339) 221-8618
xxandersen@gmail.com

From: Mass Audubon on behalf of John Chapin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:14 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. John Chapin
303 Third St, Apt 210
Cambridge, MA, MA 02142
(802) 578-8943
jchapin29@gmail.com

From: Mass Audubon on behalf of Tina Gotham
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:13 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Tina Gotham
479 Kingsbury Ave
Haverhill, MA 01835-8389
(978) 394-2474
tina.morse@rocketmail.com

From: Mass Audubon on behalf of Ed Jaros
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:13 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ed Jaros
16 Morses Pond Rd
Wellesley, MA 02482-4210
(781) 237-2809
ejjaros@aol.com

From: Mass Audubon on behalf of THERESA LATHAM
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:12 PM

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Feb 25, 2026

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Sincerely,

Ms. THERESA LATHAM
121 Camp Street, Unit 88
West Yarmouth, MA 02673
(917) 226-0264
lathamte@gmail.com

From: Mass Audubon on behalf of Thomas Connors
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:12 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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I am an avid birder, fly fisherman and outdoorsman. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Horseshoe crab eggs and juvenile horse shoe crabs are an important food source for fish.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Thomas Connors
30 Kodaya Rd
Newton, MA 02468
(617) 952-3998
thconnors@msn.com

From: Mass Audubon on behalf of Diana Laurenitis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:12 PM

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Sincerely,

Ms. Diana Laurenitis
102 N Plain Rd
Sunderland, MA 01375
(603) 398-5654
redwoodviajera@yahoo.com

From: Mass Audubon on behalf of Thomas Noble
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:11 PM

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Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. As a Cape Cod resident I am in favor of protecting the biodiversity of our shores and beaches.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Thomas Noble
34 Chipman Rd
Sandwich, MA 02563
(508) 833-6338
tnoble@horsleywitten.com

From: Mass Audubon on behalf of Margaret Miller
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:10 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I have volunteered for the past three years to count the horseshoe crab population in Plymouth harbor. Last summer was the first time there was more than one-two crabs during our watch. The crabs are vital to the food chain.
Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Margaret Miller
8 Woodsong
Plymouth, MA 02360-5528
(508) 224-0914
kdmfmiller@yahoo.com

From: Mass Audubon on behalf of Liz Field
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:09 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Liz Field
16 Windingwood Ln, Acton, MA
Acton, MA 01720
(978) 263-1440
ejefield16@comcast.net

From: Mass Audubon on behalf of Mark Tracy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:08 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Mark Tracy
706 Annursnac Hill Rd
Concord, MA 01742
(617) 417-7163
mark.tracy@alumni.stanford.edu

From: Mass Audubon on behalf of Sandra Coleman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:08 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sandra Coleman
10 Linway rd
Lincoln, MA 01773
(781) 259-0317
sazucoleman@hotmail.com

From: Mass Audubon on behalf of Janice Williamson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:08 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab are amazing animals who have survived since before man. They deserve our consideration to protect them for generations yet to come.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Janice Williamson
104 Green St
Wakefield, MA 01880
(781) 245-8324
jmwilliamson52@gmail.com

From: Mass Audubon on behalf of Sara Brydges
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:07 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sara Brydges
24 Marthas Point Rd
Concord, MA 01742
(978) 371-0123
sbrydges@comcast.net

From: Mass Audubon on behalf of Paul Rennert
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:54:07 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There is little time left to protect this declining species on which so many other species depend. Thank you - Paul

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Paul Rennert
205 Underwood St
HOLLISTON, MA 01746-1660
(508) 282-6370
rennertp@gmail.com

From: Mass Audubon on behalf of Shelda Semerjian
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:42:08 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Shelda Semerjian
27 S Cottage Road
Belmont, MA 02478
(781) 862-3211
bdaswizzle@gmail.com

From: Mass Audubon on behalf of Elizabeth Goodfellow
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:25 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Stewardship of our natural resources is crucial and under threat. Please take action to protect the horseshoe crabs.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Elizabeth Goodfellow
166 Holden St
Holden, MA 01520-1738
(585) 260-6204
e.goodfellow@gmail.com

From: Mass Audubon on behalf of Frederick Lucies
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:24 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Frederick Lucies
125 Connors St Apt 509
Gardner, MA 01440
(239) 834-7451
flucies@gmail.com

From: Mass Audubon on behalf of Joseph Ketner
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:24 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Joseph Ketner
24 Bradford Road
Natick, MA 01760
(646) 373-0774
joseph.ketner@gmail.com

From: Mass Audubon on behalf of Hannah Vered
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:23 PM

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Feb 25, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Hannah Vered
41 Chestnut Hill Ave #41
Brighton, MA 02135
(617) 935-6619
han.vered@gmail.com

From: Mass Audubon on behalf of Roselyn Farren
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:23 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Roselyn Farren
15 Maple Ave
Sharon, MA 02067-2121
(781) 784-1626
rfarren@gmail.com

From: Mass Audubon on behalf of Debra Seamans
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:22 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Debra Seamans
45 Shore Drive
Dracut, MA 01826-2029
(978) 758-7325
dseamans16@gmail.com

From: Mass Audubon on behalf of Brian Gingras
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:22 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Brian Gingras
52 Bradford Commons Lane
Braintree, MA 02184
(781) 356-0402
briangin54@comcast.net

From: Mass Audubon on behalf of Emily Kellndorfer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:21 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Horseshoe crabs are a key part of our ecosystem. Help protect them!!

Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Emily Kellndorfer
152 Two Ponds Road
Falmouth, MA 02540
(734) 645-9549
emily@kellndorfer.us

From: Mass Audubon on behalf of Anne Roy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Anne Roy
6 3rd St
Harwich, MA 02645-1137
(508) 523-8782
whenpigsfly2019@gmail.com

From: Mass Audubon on behalf of Samantha Buck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:21 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Samantha Buck
370 Montague Road
Sunderland, MA 01375
(978) 549-1370
samanthalbuck@gmail.com

From: Mass Audubon on behalf of Alison Moll
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:21 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alison Moll
29 Winthrop St
Milton, MA 02186-1510
(267) 222-0507
moll.alison@gmail.com

From: Mass Audubon on behalf of Cheryl Eifert
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:21 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Let's act now to save these prehistoric creatures for subsequent generations.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cheryl Eifert
1 Bittersweet Road
Gloucester, MA 01930
(631) 889-9516
chereifert@gmail.com

From: Mass Audubon on behalf of Margo Feeney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:20 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Margo Feeney
17 Ridge Rd
Marblehead, MA 01945
(781) 718-2629
mwf21090@gmail.com

From: Mass Audubon on behalf of jeanie mossa
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:20 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. jeanie mossa
203 Washington St #178 Salem MA 01970
Salem, MA 01970
(617) 843-5334
4pawsacupuncture@gmail.com

From: Mass Audubon on behalf of Allan Johannesen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:19 PM

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Please consider protecting this ancient species.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Allan Johannesen
4 Carleton Road
Rochdale, MA 01542-1144
(508) 847-5274
aejohannesen@gmail.com

From: Mass Audubon on behalf of John Williams
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:19 PM

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Sincerely,

Mr. John Williams
15 Brandee Ln
Methuen, MA 01844
(225) 301-1855
johnwilliams27@yahoo.com

From: Mass Audubon on behalf of lenore lobel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. lenore lobel
31 love lane
weston, MA 02493
(781) 893-3155
lenorelobel@gmail.com

From: Mass Audubon on behalf of Brian DiVasta
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Brian DiVasta
181 Captain Eames Circle
Ashland, MA 01721
(508) 216-3284
hasta934@alum.mit.edu

From: Mass Audubon on behalf of Thayer Scott
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
My walks on the Cape last year showed fewer horseshoe crabs than past years. It could be an anomaly, but it may reflect an issue. Anyway, anything more you can do more to protect this amazing crab would be appreciated.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Thayer Scott
7 STRAWBERRY LN
KINGSTON, MA 02364
(781) 291-9309
medchwc@bu.edu

From: Mass Audubon on behalf of Richard Curtis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Richard Curtis
111 Metropolitan Ave
Roslindale, MA 02131-3508
(857) 350-7220
rcurtis323@gmail.com

From: Mass Audubon on behalf of kathryn roy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Horseshoe crab eggs are a vital resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. kathryn roy
382 Marrett Rd
lexington, MA 02421
(617) 548-9240
kathryn@precisionthinking.com

From: Mass Audubon on behalf of Howard Faerstein
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Howard Faerstein
53 N. Farms Road
Florence, MA 01062
(413) 586-5436
hfaerstein@aol.com

From: Mass Audubon on behalf of Linda Perry
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:18 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. In my more than fifty years of summering on Cape Cod, I have noticed with sadness the decrease in the horseshoe crab population. Please let's work to save these remarkable animals.

Sincerely,
(Mrs.) Linda Perry
137 Grant Street
Lexington, MA 02420
lindap137@icloud.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Linda Perry
137 Grant St.
Lexington, MA 02420
(781) 863-1107
lindap137@icloud.com

From: Mass Audubon on behalf of Eileen Roche
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:17 PM

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I'm always amazed when I see horseshoe crabs on a beach, and I marvel at how long they have existed on this earth - many millions of years, much longer than humans have been around. Don't destroy them! Please help them out with this proposal. Thank you!

Eileen Roche and Stephen Donegan
5 Clyde Road
Ashland MA 01721
emrlisbeth@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Eileen Roche
5 Clyde Road
Ashland, MA 01721-2138
(508) 202-5039
emrlisbeth@gmail.com

From: Mass Audubon on behalf of Al Nierenberg
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:17 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Al Nierenberg
38 Herrick Road
Boxford, MA 01921
(617) 921-2536
alnierenberg@comcast.net

From: Mass Audubon on behalf of Richard Tonachel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:17 PM

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Sincerely,

Mr. Richard Tonachel
175 Richdale Ave Apt 310
Cambridge, MA 02140-3354
(617) 821-6120
dicktonachel@gmail.com

From: Mass Audubon on behalf of Nancy Krieger
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:17 PM

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Sincerely,

Dr. Nancy Krieger
16 Beaufort Rd Apt 5
Jamaica Plain, MA 02130
(617) 432-1571
nkrieger@hsph.harvard.edu

From: Mass Audubon on behalf of Helen Evans
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:16 PM

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Sincerely,

Ms. Helen Evans
1 d Meeting House lane
Hanson, MA 02341
(508) 866-7233
helenw508@aol.com

From: Mass Audubon on behalf of Holiday Houck
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:16 PM

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Sincerely,

Mrs. Holiday Houck
192 Commonwealth Ave
Boston, MA 02116
(617) 353-1539
holidayh@aol.com

From: Mass Audubon on behalf of Christine Vandiver
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:15 PM

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Sincerely,

Ms. Christine Vandiver
10 Wakefield Ave
Saugus, MA 01906-2757
(919) 889-1658
both@vandiver.org

From: Mass Audubon on behalf of Jean Patton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:15 PM

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Sincerely,

Ms. Jean Patton
88 steven St
Hanson, MA 02341-1312
(781) 635-8821
jeanmwpatton@mac.com

From: Mass Audubon on behalf of David Cash
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:14 PM

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Sincerely,

Mr. David Cash
153 Broadway
Haverhill, MA 01832
(617) 785-8899
dwcash@gmail.com

From: Mass Audubon on behalf of Margaret Conover
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:14 PM

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Horseshoe crabs have a special place in the hearts of Cape Codders! Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Margaret Conover
21 Karen Way
Orleans, MA 02653
(774) 722-7940
conoveml@gmail.com

From: Mass Audubon on behalf of Debby Young
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:14 PM

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Sincerely,

Mrs. Debby Young
Flanagan Drive
Framingham, MA 01701
(508) 877-3677
debby_dscribe@comcast.net

From: Mass Audubon on behalf of Naticia Hutchins
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:14 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Naticia Hutchins
93 Cedar St #2
Somerville, MA 02143
(908) 399-0000
naticia27@gmail.com

From: Mass Audubon on behalf of Megan Dobroth
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I have helped with the annual survey with my daughter. She has gone into medicine after learning about these an=mazing animals. We need to ensure that they do not die out as they are critical to our own health.

In addition,Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Megan Dobroth
26 Francis Street
Brookline, MA 02446
(617) 513-4766
mmdobroth@gmail.com

From: Mass Audubon on behalf of David Fowler
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:13 PM

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Feb 25, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Fowler
4903 Oak Point Dr.
Middleboro, MA 02346
(508) 923-9582
dsfowler45@gmail.com

From: Mass Audubon on behalf of Ray Verrier
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:13 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ray Verrier
14 Dawson Circle
Holden, MA 01520
(508) 831-5747
rayverrier@gmail.com

From: Mass Audubon on behalf of Ellen Hopman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:13 PM

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Feb 25, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I remember Horseshoe crabs from my childhood. There were so many more than now. They need to be protected! Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ellen Hopman
67 Munsell St
Belchertown, MA 01007
(413) 323-4494
eehopmanauthor@earthlink.net

From: Mass Audubon on behalf of Stephanie Roy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:13 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Stephanie Roy
3 Camelot Dr
Paxton, MA 01612-1257
(508) 753-1661
meowroy@verizon.net

From: Mass Audubon on behalf of Christine Radice
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:12 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Christine Radice
132 Brooks St
Brighton, MA 02135-1713
(617) 460-6832
christineradice@yahoo.com

From: Mass Audubon on behalf of Nancy Solomon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:12 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Nancy Solomon
10 Birchwood Cir
Sharon, MA 02067-2353
(781) 784-9477
nancysolomon2018@gmail.com

From: Mass Audubon on behalf of Karen Riccadonna
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:12 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Karen Riccadonna
2 Symmes Road
Franklin, MA 02038
(508) 981-8925
kriccadonna@gmail.com

From: Mass Audubon on behalf of Mary Loeken
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:12 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Mary Loeken
360 Arborway
Boston, MA 02130
(508) 208-2376
mary.loeken@joslin.harvard.edu

From: Mass Audubon on behalf of Julia Woodward
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:11 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Julia Woodward
5 cresthill rd
Boston, MA 02135
(508) 868-2102
juliawoodward18@gmail.com

From: Mass Audubon on behalf of Ninian Stein
To: Marine Fish (FWE)
Subject: Mother and Scientist Says Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:11 PM

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Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a mother and scientist, I know that horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Ninian Stein
163 Concord Rd
Wayland, MA 01778-1426
(617) 710-5937
ninian.stein@tufts.edu

From: Mass Audubon on behalf of Heather Hill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:11 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Heather Hill
6 Prides Path
Orleans, MA 02653
(704) 578-7470
heatheracehill@gmail.com

From: Mass Audubon on behalf of Timothy Belford
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:11 PM

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Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Timothy Belford
8 Albion St
Medford, MA 02155
(516) 317-2114
tbelford24@gmail.com

From: Mass Audubon on behalf of Bonnie Clendenning
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:10 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Bonnie Clendenning
23 Blake Street
Newton, MA 02460
(617) 969-9666
clendenning@verizon.net

From: Mass Audubon on behalf of d schiff
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:09 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. d schiff
192 Poplar St
Roslindale, MA 02131
(857) 488-6131
weenabeena@yahoo.com

From: Mass Audubon on behalf of Joan LeBel
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:09 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
As a physician I know there is a synthetic alternative and it should be used.We need. not take blood or anything else from horseshoe crabs!!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Joan LeBel
515 Weld St
West Roxbury, MA 02132-1333
(617) 325-9720
joanie.lebel@icloud.com

From: Mass Audubon on behalf of Sandra Schumacher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:09 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Sandra Schumacher
111 Perkins St Apt 20
Jamaica Plain, MA 02130-4320
(617) 318-8955
schum033@alumni.umn.edu

From: Mass Audubon on behalf of Ruibing Wang
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:09 PM

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Feb 25, 2026

Director Daniel McKiernan

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a beacon for conservation, MA should set better examples for the rest of the country and the world. Protecting horseshoe crabs would protect migratory birds. We can do better and we should do better to such an iconic species since we have the power to do so.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ruibing Wang
24 Robbins Rd
Sudbury, MA 01776-2918
(508) 380-9676
ruibingw@gmail.com

From: Mass Audubon on behalf of Sonja Wadman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:09 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sonja Wadman
162 GROVE ST
AUBURNDALE, MA 02466
(857) 231-1558
sonjawadman@gmail.com

From: Mass Audubon on behalf of William Phippen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:09 PM

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Sincerely,

Mr. William Phippen
10 Dodges Row
Wenham, MA 01984
(978) 837-2900
w.phippen@comcast.net

From: Mass Audubon on behalf of Jennifer Gaffney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:08 PM

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Feb 25, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jennifer Gaffney
18 1/2 Webb St
Salem, MA 01970
(781) 718-3157
jgaffney780@gmail.com

From: Mass Audubon on behalf of Natalie Burgo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:08 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 25, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Natalie Burgo
40 Briggs Lane
Marion, MA 02738
(440) 420-0674
nburgo28@gmail.com

From: Mass Audubon on behalf of Claudia Goldin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:08 PM

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Feb 25, 2026

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds. I know that rare and migratory shorebirds feed on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. It is extremely important to maintain the horseshoe crabs to keep the birds alive (and the crabs!).
Many thanks.
Claudia Goldin
Professor of Economics
Harvard University

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Claudia Goldin
14 Scott Street
Cambridge, MA 02138
(617) 877-4277
cgoldin@harvard.edu

From: Mass Audubon on behalf of Sunita Kumar
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:08 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

It is very important that we focus on these ancient creatures and protecting them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sunita Kumar
183 Kirkland Drive
Stow, MA 01775
(917) 692-5434
modernwitch@protonmail.com

From: Mass Audubon on behalf of Julianne Hooper
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:07 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Julianne Hooper
7 Hanson rd
Wilmington, MA 01887
(978) 604-7236
juliannemarieh@gmail.com

From: Mass Audubon on behalf of Janet Waldron
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:07 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Janet Waldron
6 Amy's Way
Franklin, MA 02038
(617) 800-5805
janwaldr@gmail.com

From: Mass Audubon on behalf of Kimberly Proctor
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:06 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kimberly Proctor
60 Crown St
Milton, MA 02186
(617) 755-6885
kimproctor.cats@gmail.com

From: Mass Audubon on behalf of Cornelia Hoskin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 4:41:06 PM

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Feb 25, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cornelia Hoskin
325 Pond Street
Jamaica Plain, MA 02130-2445
(617) 945-3599
corneliahoskin@hotmail.com

From: Mass Audubon on behalf of Julia Breed
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Wednesday, February 25, 2026 9:40:28 AM

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Feb 25, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Both shorebirds and horseshoe crabs are already threatened by climate change and coastal development. The additional stressor of harvesting horseshoe crabs for bait is unnecessary and may have devastating consequences, including collapsing the food chain that supplies the migration of shorebirds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Julia Breed
22 Monument Dr
Oxford, MA 01540
(508) 847-1269
juliabreed12@gmail.com

From: Mass Audubon on behalf of Katie Walsh
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, February 24, 2026 9:23:03 PM

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Feb 24, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Katie Walsh
25 Hunters Gln Apt 11
Marshfield, MA 02050
(339) 224-8648
walsh.katieanne@gmail.com

From: Mass Audubon on behalf of Ethan Thibault
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal!
Date: Tuesday, February 24, 2026 4:08:50 PM

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Feb 24, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ethan Thibault
47 Washington St
Ayer, MA 01432
(339) 364-9901
ethanthi@gmail.com

From: Mass Audubon on behalf of Kerry Chios
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, February 24, 2026 1:52:33 PM

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Feb 24, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kerry Chios
9 Maurice St
Worcester, MA 01604
(508) 930-7937
kerrychios@gmail.com

From: Mass Audubon on behalf of Molly Potts
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, February 24, 2026 11:38:24 AM

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Feb 24, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Molly Potts
28 Houghton St
Somerville, MA 02143
(412) 225-6881
mollycpotts@gmail.com

From: Mass Audubon on behalf of Heinz Remold
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, February 24, 2026 11:21:18 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Heinz Remold
197 Clinton Road
Brookline, MA 02445
(617) 276-3604
heinzremild@gmail.com

From: Mass Audubon on behalf of MaryJo Stanley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Tuesday, February 24, 2026 11:08:17 AM

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Feb 24, 2026

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During my last visit to Eastham I watched a few horseshoe crabs leisurely slide through the coastal water. What a marvel!

And now to learn that the crabs' eggs are a crucial resource for global migratory birds, it is imperative that you act on protecting them.

Shorebirds are among the most rapidly declining group of birds. Can you imagine a visit to the shores without seeing a single healthy bird?

I don't want to.

And I don't want my grandchildren not being able to respect and honor them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. MaryJo Stanley
85 Pine St
Florence, MA 01062
(413) 586-7101
jojostanley@yahoo.com

From: Mass Audubon on behalf of Kayla Creamer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 10:37:08 PM

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Feb 23, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kayla Creamer
18 GARDNER LN
Ayer, MA 01432
(978) 391-9706
gonepats54@gmail.com

From: Mass Audubon on behalf of Sheila Bailey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 7:36:50 PM

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Feb 23, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Millions of years of evolution have made the horseshoe crab and essential part of the New England ecosystem and as stewards of the environment, we owe it to each other to protect our wildlife.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sheila Bailey
948 HIGHLAND AVE
Medford, MA 02155
(617) 785-9331
sheilaxmarie@gmail.com

From: Mass Audubon on behalf of Courtney Smith
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 7:19:59 PM

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There isn't really a cogent reason to continue harvesting horseshoe crabs any longer now that researchers can use *synthetic* Recombinant factor C and recombinant cascade reagent to test pharmaceuticals for endotoxins without the use of horseshoe crab blood. Reducing the harvest quota will slowly help horseshoe crab populations rebound, which will also have an extremely positive effect on sea bird populations that depend on their eggs for fuel during migration periods.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Courtney Smith
121 Cambridge Rd
Woburn, MA 01801
(617) 504-8101
morayeel423@anglernook.com

From: Mass Audubon on behalf of Sara Smith
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 5:36:41 PM

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Feb 23, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sara Smith
PO Box 294
Hatfield, MA 01038
(413) 341-0430
saraeliz413@gmail.com

From: Mass Audubon on behalf of Ginny Ansbergs
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 3:49:39 PM

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Feb 23, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

We have lost so many crucial species. PLEASE don't let the horseshoe crab be added to that list!

Thank you!

Sincerely, Ginny Ansbergs 133 East Main Street Plainfield, MA 01070

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ginny Ansbergs
133 East Main Street
Plainfield, MA 01070
(413) 634-8076
ginny.rose@verizon.net

From: Mass Audubon on behalf of Kathryn Jamie
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 12:49:29 PM

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Feb 23, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Kathryn Jamie
52 Village Circle
Milford, MA 01757
(508) 284-2510
kejacksonteacher@gmail.com

From: Mass Audubon on behalf of Shannon Starkweather Burke
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 12:49:24 PM

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Feb 23, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Shannon Starkweather Burke
181 East Street
EASTHAMPTON, MA 01027-1211
(931) 801-1772
shannonstarkweatherburke@gmail.com

From: Mass Audubon on behalf of Emily Greenspan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 11:15:39 AM

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Feb 23, 2026

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Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are an iconic and prehistoric species that serve as a lynchpin for biodiverse marine ecosystems. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Emily Greenspan
15 Quail Run
Wellfleet, MA 02667
(646) 823-5882
ergreenspan@yahoo.com

From: Mass Audubon on behalf of Beverly Droz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, February 23, 2026 10:15:36 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 23, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. So we must do whatever works best to help them.

Thank you very much for your time and your work!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Beverly Droz
35 ISLINGTON ROAD
NEWTON, MA 02466
(617) 987-6543
bevdroz@comcast.net

From: Mass Audubon on behalf of Matthew Titus
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 8:53:50 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Matthew Titus
22 Water Street
Cambridge, MA 02141
(508) 847-0077
mtitus5@gmail.com

From: Mass Audubon on behalf of Elena Tillman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 7:23:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Elena Tillman
133 Amherst Rd
South Hadley, MA 01075
(413) 535-9622
tillman.elena@gmail.com

From: Mass Audubon on behalf of Kerry Gallagher-Rebolo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 6:23:40 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kerry Gallagher-Rebolo
135 Ferncrest Dr.
Taunton, MA 02780
(508) 823-7040
krebolo@verizon.net

From: Mass Audubon on behalf of Jessie Knowlton
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 5:53:38 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Jessie Knowlton
330 Long Pond Rd
Plymouth, MA 02360
(906) 275-8896
knowlton_jessie@wheatoncollege.edu

From: Mass Audubon on behalf of Kelly Carlson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 3:53:23 PM

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Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Kelly Carlson
58 Eaton St
Concord, MA 01742
(508) 735-1292
kcarlso3@me.com

From: Mass Audubon on behalf of Jill Mathieu
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 3:23:21 PM

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Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jill Mathieu
182 N Worcester St
Norton, MA 02766-2031
(508) 241-0933
jjmathieu01@hotmail.com

From: Mass Audubon on behalf of Louisel Frontiero
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 3:23:19 PM

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Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.Please consider these changes as wildlife relies on them

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Louisel Frontiero
178 Essex Ave
Gloucester, MA 01930
(978) 559-9199
louisefr@comcast.net

From: Mass Audubon on behalf of Alyse Crane
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 12:23:01 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a lifelong resident of Hull MA at the Gut 65 years I used to see horseshoe crabs all the time when I was young. Now there only a handful seen all summer long in the area! Please help pass this law!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Alyse Crane
9 Arthur St
Hull, MA 02045
(781) 953-7044
abcrane425@hotmail.com

From: Mass Audubon on behalf of Jeff Lyness
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 11:22:54 AM

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Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Sincerely Jeff

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jeff Lyness
16 Providence road
Sutton, MA 01590
(508) 266-1370
jefflyness@icloud.com

From: Mass Audubon on behalf of Virginia Mahoney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 10:52:50 AM

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Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Virginia Mahoney
16 Providence Rd Apt Rear
Sutton, MA 01590
(774) 287-6144
vsmahoney24@gmail.com

From: Mass Audubon on behalf of Rachel Kohn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 10:52:48 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rachel Kohn
192 Market St
Amesbury, MA 01913
(978) 430-6901
rkohn3@me.com

From: Mass Audubon on behalf of Elizabeth Parker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Sunday, February 22, 2026 7:52:40 AM

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Feb 22, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Parker
208 Court St
Plymouth, MA 02360
(508) 982-4865
bettylouparker@comcast.net

From: Mass Audubon on behalf of Jennifer Tripp
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 8:37:38 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennifer Tripp
539 Potomska Rd
Dartmouth, MA 02748
(864) 504-5849
jenntripp@yahoo.com

From: Mass Audubon on behalf of Elisabeth Green
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 8:37:36 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elisabeth Green
3 Grew Hill Road
Roslindale, MA 02131
(617) 469-4567
ecgreen71@gmail.com

From: Mass Audubon on behalf of Sheila Kojm
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 8:37:36 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Shorebirds are among the most rapidly declining group of birds. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on Horseshoe Crab eggs at Monomoy, where horseshoe crab harvest is forbidden.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sheila Kojm
7 Orchard Road
Bedford, MA 01730
(781) 555-1212
boston_kojm@yahoo.com

From: Mass Audubon on behalf of Brie Bortmess
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 4:14:29 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Please protect these iconic crabs. They've been around way before us and humans stand to be their downfall like they have been to countless other entire species.
Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Brie Bortmess
14 Morton Ave
North Dartmouth, MA 02747
(508) 542-3117
brielin024@gmail.com

From: Mass Audubon on behalf of Kimberly Chester
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 2:14:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Every day we learn more about how every living organism is part of the greater web of which we are only a part.
Let's protect these ancient creatures!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kimberly Chester
6 Perry St.
Sherborn, MA 01770
(508) 397-7127
kbellchester@gmail.com

From: Mass Audubon on behalf of Alan Bedard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 2:14:15 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Alan Bedard
75 south st
Wareham, MA 02532
774201328
arbedard73@gmail.com

From: Mass Audubon on behalf of Katie Koerten
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 2:14:15 PM

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Feb 21, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Katie Koerten
54 Jensen Street
Belchertown, MA 01007
(508) 269-7706
kkoerten@gmail.com

From: Mass Audubon on behalf of Maia Simpson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 1:44:14 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Dear Director Daniel McKiernan

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely. Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Additionally, horseshoe crabs are a vital link to antiquity; they remind me that my history is so small in comparison to these ancient beings. I would be heartbroken if my child were to grow up in a world without knowing these "dinosaur" crustaceans.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Thank you,
Maia Simpson

181 Sycamore Street
Boston, MA 02131
maia.simp@gmail.com

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maia Simpson
181 Sycamore Street
Boston, MA 02131
(207) 475-8026
maia.simp@gmail.com

From: Mass Audubon on behalf of Joan Stone
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 1:44:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I first learned about horseshoe crabs as a child in the early 70s since they were abundant on Popponesset Beach. It wasn't until recently that I learned that they are harvested for bait and for use in the biomedical industry, logical explanations of the decline in their population.
Horseshoe crabs are important to migratory birds and the local ecology. I'm writing to urge you to adopt the proposed regulation changes.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Joan Stone
34 PORTER ST
Wenham, MA 01984
(978) 335-0104
joan.stone@comcast.net

From: Mass Audubon on behalf of Charlotte Ikels
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 12:44:07 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Dear Director McKiernan,

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Sincerely,
Charlotte Ikels
14 Sumner Road
Cambridge, MA 02138

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Charlotte Ikels
14 Sumner Road
Cambridge, MA 02138
(617) 354-4079
cxi@case.edu

From: Mass Audubon on behalf of Charlie Welch
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 12:44:07 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Charlie Welch
PO Box 1043
Provincetown, MA 02657
(347) 244-4601
cfwelch67@me.com

From: Mass Audubon on behalf of Richard Gilson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 12:14:06 PM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Richard Gilson
20 temple st
Boston, MA 02132
(617) 325-0957
rclayg07@icloud.com

From: Mass Audubon on behalf of Sarah Thornington
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 12:14:05 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

We as humans have created most of the dangers to our wildlife, so it is up to us now to be a voice for the voiceless. Horseshoe crabs have been around and virtually unchanged for millions of years, they are now listed on the IUCN red list as Vulnerable. They made it through the age of the dinosaur, should they not also make it through the age of the human? Please use your power for good!

Horseshoe crab eggs are a crucial resource for global migratory birds, like endangered Red Knots, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sarah Thornington
33 Lorena
West Yarmouth, MA 02673
(508) 776-2773
sarah@thestudiobythesea.com

From: Mass Audubon on behalf of Charles Patterson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 10:44:01 AM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Charles Patterson
178 Tiffany Rd
Norwell, MA 02061
(781) 204-0026
chaspatt@comcast.net

From: Mass Audubon on behalf of Caitlin Shaughnessy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 10:13:57 AM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Caitlin Shaughnessy
218 Brookway Drive
Northbridge, MA 01534
(774) 293-0565
shaughncp@gmail.com

From: Mass Audubon on behalf of Mary Crotty
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 10:13:56 AM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary Crotty
4 Lakewood Rd
Natick, MA 01760
(617) 921-0679
mary@peaceconsulting.com

From: Mass Audubon on behalf of Christine Erb
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 10:13:56 AM

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Feb 21, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. I remember seeing them--really an important part of learning about and celebrating our MA environment.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Christine Erb
729 N. Main St.
Lanesborough, MA 01237
(413) 439-5284
chris.erb.ma@gmail.com

From: Mass Audubon on behalf of G Richard Kramer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 9:43:54 AM

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Feb 21, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. G Richard Kramer
148 NYES NECK ROAD EAST
CENTERVILLE, MA 02632
(508) 362-6659
grichardkramer@yahoo.com

From: Mass Audubon on behalf of David McWeeney
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 9:13:52 AM

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Feb 21, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David McWeeney
3 Pilgrim Ln
Medfield, MA 02052-3213
(781) 316-5124
david@lush-landscapes.com

From: Mass Audubon on behalf of Lilia Davis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 8:43:52 AM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As an educator I work relentlessly to teach my students the importance of conservation. The horseshoe crab is a keystone species and our local marine ecosystem will collapse without them. I urge you to choose safer bait options. We need our horseshoe crabs and we needs to be role models so our your know how important wildlife protection is.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Lilia Davis
38 Forsythia Drive
Harwich, MA 02645
(508) 737-1304
nickerson.lilia@gmail.com

From: Mass Audubon on behalf of Caitlin FitzGerald
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 8:13:51 AM

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Feb 21, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Horseshoe crabs are a prehistoric species, having been around virtually unchanged for hundreds of millions of years, and we risk putting all that history to an end unnecessarily. Climate change alone gives them enough to contend with. We don't need to make it worse.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Caitlin FitzGerald
6 PIERCE ST, APT 3
Quincy, MA 02171
(617) 308-2610
cmlfitzgerald@gmail.com

From: Mass Audubon on behalf of Sherri Dennis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 7:13:46 AM

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Feb 21, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

They have been around for millennia. They are part of our ecosystem & drug testing. Why wouldn't we protect them in any way we can?

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Sherri Dennis
361 Cotuit Bay Dr
Cotuit, MA 02635
(508) 776-5433
sherri.dennis11@gmail.com

From: Mass Audubon on behalf of Monique Villars
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 6:43:43 AM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a long-time seasonal resident of Orleans, I have personally witnessed the decreasing number of these amazing creatures in the estuarine waters of Pleasant Bay and Nauset Marsh. Additionally, as someone who was worked my entire professional career in water management and coastal protection, I am very aware of how vulnerable our most precious environments and ecosystems are.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Monique Villars
154 Pochet Rd
East Orleans, MA 02643
(508) 255-2676
nicki.and.jos@gmail.com

From: Mass Audubon on behalf of Camilla Thompson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 6:43:40 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I grew up searching for Horseshoe crabs in tidal ponds and at low tide. When my kids were my age, I noticed that we didn't see them anymore or if we did, it was rare. The Horseshoe crab is a vital animal to our ecosystem and should not be used for experiments or bait.

Please... please do something!

-Camilla Thompson

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Camilla Thompson
649 Goodrich St
Lunenburg, MA 01462
(978) 424-6721
camillathompson2@gmail.com

From: Mass Audubon on behalf of Beth Kressley Goldstein
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 4:43:33 AM

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Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

As a lifelong visitor to Cape Cod and a property owner for 20+ years, I can share first hand experiences with watching shorebird breeding and migration through Massachusetts' coastal areas. Horseshoe crab eggs are vital nourishment for these birds to maintain healthy populations. Horseshoe crabs themselves are wonderful to observe with their prehistoric looking bodies and their seasonal returns for breeding. They are the delight and wonder for countless visitors and children.

These creatures are special and they serve and important purpose worthy of further protection.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Beth Kressley Goldstein
432 Concord Rd
Weston, MA 02493
(617) 281-0032
dgoldstein_98@yahoo.com

From: Mass Audubon on behalf of Lori Tsuruda
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Saturday, February 21, 2026 2:13:46 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 21, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lori Tsuruda
5 Milton Terrace
Randolph, MA 02368
(781) 963-0373
ltsuruda@gmail.com

From: Mass Audubon on behalf of Judith COLTMAN
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:13:01 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Judith COLTMAN
18 Milton Rd
Reading, MA 01867
(781) 944-5739
judy.coltman@verizon.net

From: Mass Audubon on behalf of Spyros Braoudakis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:12:55 PM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Spyros Braoudakis
110 Storrs Ave
Braintree, MA 02184
(781) 848-3887
sbraoudakis@hotmail.com

From: Mass Audubon on behalf of Hayley Winfield
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:12:54 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Hayley Winfield
24 Donahue Rd
Brewster, MA 02631
(978) 402-5472
hayley.winfield@yahoo.com

From: Mass Audubon on behalf of Laura Demers
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:42:50 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

My daughter and I love to walk the protected beaches and love seeing horseshoe crabs, though we see less and less each year. Please stop using these as 'bait'.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Laura Demers
49 Lakeview Pl
Taunton, MA 02780
(508) 838-4478
lgdemers@yahoo.com

From: Mass Audubon on behalf of Jeffrey Oishi
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:42:50 PM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Jeffrey Oishi
45-5 Cogswell Ave
Cambridge, MA 02140
(347) 432-9203
jeff.oishi@pm.me

From: Mass Audubon on behalf of Danielle Castronovo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:42:47 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Danielle Castronovo
45 Cogswell Avenue #5
Cambridge, MA 02140
(516) 457-2471
dcastronovo@hotmail.com

From: Mass Audubon on behalf of Gabriel Nielsen-Nunez
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:12:48 PM

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Feb 20, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Gabriel Nielsen-Nunez
33 Magazine St Apt D
Cambridge, MA 02139
(617) 233-9288
gnielsennunez@gmail.com

From: Mass Audubon on behalf of Carol Goslant
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:12:47 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Carol Goslant
21 Carver Street
Cambridge, MA 02138
(617) 576-3294
clackim@mac.com

From: Mass Audubon on behalf of Susan Oliveira
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:12:47 PM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Susan Oliveira
23 Sisson Farm Ln
Westport, MA 02790
(774) 328-1528
sueoliveira23@gmail.com

From: Mass Audubon on behalf of Kathleen Heffernan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:12:46 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Heffernan
50 Old Farm Rd
Bridgewater, MA 02324-3448
(774) 222-2907
jkheff697.kh@gmail.com

From: Mass Audubon on behalf of MaryAnna Foskett
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:12:46 PM

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Feb 20, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. MaryAnna Foskett
101 Brantwood Rd
Arlington, MA 02476-8005
(781) 646-5882
maryanna@foskettco.com

From: Mass Audubon on behalf of Abigail Heim
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:12:45 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Abigail Heim
138 Hillside St
Rowley, MA 01969-1615
(978) 500-5515
amheim2@gmail.com

From: Mass Audubon on behalf of Susan Baeslack
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:12:42 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Baeslack
20 Montvale Street
Bradford, MA 01835
(978) 374-6529
sawwhet7707@verizon.net

From: Mass Audubon on behalf of Ben Baron
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:12:42 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

I love seeing horseshoe crabs, and people from out of state like seeing them even more as they are rare throughout the US. Additionally, horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Ben Baron
28 Egerton Road
Arlington, MA 02474
(781) 850-5316
ben.baron4@gmail.com

From: Gretchen L Mueller
To: Marine Fish (FWE)
Subject: Please stop the use of horseshoe crabs as bait
Date: Friday, February 20, 2026 8:02:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a summer Cape Cod resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Gretchen L Mueller
East Falmouth, MA

From: Mass Audubon on behalf of Kathleen Mortenson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:42:44 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Mortenson
116 PIN OAK WAY
Falmouth, MA 02540
(508) 457-4410
mortensonk@aol.com

From: Mass Audubon on behalf of Lorna Hochstein
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:42:43 PM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I really wish that these shorebirds continue to thrive so that my grandchildren will be able to see them, appreciate them and enjoy them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lorna Hochstein
66 Summit Rd
Medford, MA 02155-3011
(781) 879-9230
lmhmem@gmail.com

From: Mass Audubon on behalf of Jessica Rouse
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:42:41 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jessica Rouse
297 Hemenway Street
Marlborough, MA 01752
(508) 265-1079
noun5@yahoo.com

From: Mass Audubon on behalf of Judith Shumway
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:42:41 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Judith Shumway
278 Capn Lijahs Rd
Centerville, MA 02632-1602
(802) 379-4424
jashum@comcast.net

From: Mass Audubon on behalf of Susan Grimwood
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:12:39 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Susan Grimwood
19 Maple St., Apt 20
Amesbury, MA 01913-1328
(978) 792-5531
sjgrimwood@verizon.net

From: Mass Audubon on behalf of Mary Stevend
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:12:39 PM

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Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Mary Stevend
67 Lake Drive
South Hamilton, MA 01982
(978) 468-3248
mary_stevens@comcast.net

From: Mass Audubon on behalf of Julie Pickett
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:12:39 PM

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Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

This harvest seems cruel and unnecessary. Please consider this appeal.

Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Julie Pickett
14 Femia Road
Ashland, MA 01721
(508) 881-8816
jpickett22@hotmail.com

From: Mass Audubon on behalf of Steven Ramar
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:12:39 PM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Steven Ramar
148 west main street, c105
Hyannis, MA 02601
(508) 775-3951
steve.ramar@comcast.net

From: Mass Audubon on behalf of Jennifer Toomey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:12:38 PM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

For a creature that has existed for 450 million years it deserves more respect and care in the critical part of our bottom dwelling, coastal ecosystem.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jennifer Toomey
54 Main Street
Carver, MA 02330
(774) 225-2251
jennifer.toomey@gmail.com

From: Mass Audubon on behalf of Elizabeth DelSignore
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:42:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

As a native Masshole, I beg you to vote for reducing the number of horseshoe crabs harvested each year in the Bay State.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth DelSignore
20 Lawson Ave
Lancaster, MA 01523
(617) 549-2344
elizabeth.delsignore@gmail.com

From: Mass Audubon on behalf of Rob Vandenabeele
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:42:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Rob Vandenabeele
40 Inman St
Cambridge, MA 02139-2416
(617) 335-8618
ecofriendlybeerdrinker@gmail.com

From: Mass Audubon on behalf of Marilyn Tillinghast
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:42:36 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Marilyn Tillinghast
1200 Salem St 181
Lynnfield, MA 01940
(860) 729-0349
marilyntillinghast@gmail.com

From: Mass Audubon on behalf of Michelle Kofler
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:42:36 PM

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Feb 20, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Michelle Kofler
115 Lee Rd
South Deerfield, MA 01373
(413) 665-2112
mlkofler@hotmail.com

From: Mass Audubon on behalf of Resa Blatman
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:12:34 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Resa Blatman
42 Bartlett Street
Somerville, MA 02145
(617) 623-7840
resa@blatmandesign.com

From: Mass Audubon on behalf of Lisa G
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:12:33 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lisa G
197 Boston Post Rd W
Marlborough, MA 01752
(508) 435-1000
lareyneleveult@yahoo.com

From: Mass Audubon on behalf of Kathleen McHendry
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:12:33 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen McHendry
281 Chauncey Walker St Lot 105
Belchertown, MA 01007
(413) 250-8961
kfmc64@protonmail.com

From: Mass Audubon on behalf of Susan Murray
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:12:32 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Susan Murray
6 Halcyon Farm Road
Lakeville, MA 02347-2200
(508) 946-5673
msmurray6@comcast.net

From: Mass Audubon on behalf of Pam Turick
To: Marine Fish (FWE)
Subject: Will YOU Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:12:32 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Pam Turick
388 River Rd
westport, MA 02790
(508) 636-2750
pturick@warpmail.net

From: Mass Audubon on behalf of Melissa Winters
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:12:31 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

We used to see live horseshoe crabs all the time 15 years ago - now I can count on one hand how many I see in the summer. They need protection. And many companies are transitioning away from using their blood.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Melissa Winters
62 Purple Meadow Rd
Bernardston, MA 01337-9661
(413) 773-9988
melissa1wine@yahoo.com

From: Mass Audubon on behalf of Brock Cordeiro
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 5:42:53 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Brock Cordeiro
15 Sagamore Drive
Dartmouth, MA 02748-1261
(508) 264-1600
bncordeiro@comcast.net

From: Mass Audubon on behalf of Melanie Abrams
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 5:42:29 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Please protect these living fossils! They are in decline for pharmaceutical harvesting; let's not also pressure their populations as bait.

In addition, Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Melanie Abrams
10 Agassiz St
Cambridge, MA 02140-2823
(617) 453-8116
melanie_bernette@yahoo.com

From: Mass Audubon on behalf of Sofia Montemayor-Thomas
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 5:42:29 PM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sofia Montemayor-Thomas
21 Seneca Rd
Acton, MA 01720
(512) 688-9473
cheetahsprinter@gmail.com

From: Mass Audubon on behalf of Elaine Abrams
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 5:12:27 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. While we understand the importance of biomedical advancement, we must also recognize smart the overall impact on the food web in this decision!!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elaine Abrams
9 Fletcher Reach'
Plymouth, MA 02360
(203) 241-9510
elaineabramsrn@gmail.com

From: Mass Audubon on behalf of Paula Myles
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 4:42:24 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Paula Myles
163 Main Street
Harwich, MA 02645
(508) 432-4402
carefulhands@earthlink.net

From: Mass Audubon on behalf of Claire Inzerillo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 4:12:23 PM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. I have fond memories growing up chasing horseshoe crabs through the shallow tides in the ocean.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Claire Inzerillo
41 Stevens St
Revere, MA 02151
(908) 956-1792
claireinz99@gmail.com

From: Mass Audubon on behalf of Ashley Haynes
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 3:42:20 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Ashley Haynes
19 Bixby Rd
Spencer, MA 01562
(857) 333-2815
a_haynes90@outlook.com

From: Mass Audubon on behalf of David Shapiro
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 3:42:19 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Shapiro
15 Hardings Way
Truro, MA 02666
(781) 690-4590
dshapiro44000@gmail.com

From: Mass Audubon on behalf of Marilyn Konefal
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 3:42:19 PM

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Feb 20, 2026

Director Daniel McKiernan

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Marilyn Konefal
34 ELAINE DR
Pittsfield, MA 01201
(413) 770-1559
mukonefal@hotmail.com

From: Mass Audubon on behalf of Richelle Bass
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 3:42:18 PM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Wish for my future great grand kids to have the same experience as I have seeing horseshoe crab on the beach.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Richelle Bass
9 Beaman rd
Sterling, MA 01564
(508) 854-8084
rickysheiy@gmail.com

From: Mass Audubon on behalf of marci cemenska
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 3:12:18 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

It is terrible what is done to these horseshoe crabs. For the biomedical industry, there are readily available alternatives. Let's leave these creatures alone!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. marci cemenska
59 Outlook Drive
Lexington, MA 02421
(781) 883-8961
marci_cemenska@yahoo.com

From: Mass Audubon on behalf of Emily Gallagher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:42:00 PM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs are an extremely important arthropod in life history. Virtually unchanged since the Ordovician period, these living fossils are crucial to our understanding of evolutionary paleobiology. We study their blood for cures to disease. Please do not allow the poaching of these crucial animals for bait.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Emily Gallagher
17 Flossmore Road
East Falmouth, MA 02536
(774) 392-5282
basil.pitch@gmail.com

From: Mass Audubon on behalf of Juli Lohnes
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:41:59 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crabs have declined so much I rarely see them anymore at my local beaches. This is such a shame since horseshoe crabs are an ancient species on the decline.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Juli Lohnes
19 Pamela Rd
Framingham, MA 01701
(508) 641-2202
jlohnes19@yahoo.com

From: Mass Audubon on behalf of Rain Harbison
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:41:59 PM

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rain Harbison
Box 455
Nantucket, MA 02554
(508) 257-0357
rainh@msn.com

From: Mass Audubon on behalf of Seth Cohen
To: Marine Fish (FWE)
Subject: horseshoe crab proposal
Date: Friday, February 20, 2026 12:41:59 PM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Seth Cohen
18 Alcott Ln
Westwood, MA 02090
(781) 710-8461
yeastgod@aol.com

From: Mass Audubon on behalf of Tina Halfpenny
To: Marine Fish (FWE)
Subject: approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:41:59 PM

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Feb 20, 2026

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Horseshoe crabs, like so many other wildly unique species to our coastlines are rapidly declining in numbers. I grew up playing with the shells on the beach and I haven't seen more than a piece of a shell in years. My kids have never seen a live horseshoe crab.
They are increasingly fished/hunted for a growing number of uses and I wholeheartedly agree that the culling needs to be limited and managed.

Thank you for your action to protect this unique creature.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Tina Halfpenny
123 Westminster Ave
Arlington, MA 02474
(617) 997-2883
c2halfpenny@gmail.com

From: Mass Audubon on behalf of Stephanie Mitzenmacher
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:41:58 PM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Stephanie Mitzenmacher
33 Cary Ave
Lexington, MA 02421
(339) 223-9030
stephanie.mitz@gmail.com

From: Mass Audubon on behalf of Kendra Parker
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Friday, February 20, 2026 12:41:58 PM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kendra Parker
442 Parker St
New Bedford, MA 02740
(508) 971-7888
kendrammurray@gmail.com

From: Mass Audubon on behalf of Fred Dolan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:11:56 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Fred Dolan
20 Devon Road
Newton, MA 02459
(617) 610-0234
fredepdolan@gmail.com

From: Mass Audubon on behalf of stephanie saniuk
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:41:54 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. stephanie saniuk
3 Tucker Terrace
Methuen, MA 01844
(774) 283-3460
steph710@verizon.net

From: Mass Audubon on behalf of Devon Pritchett
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:11:52 AM

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Feb 20, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Devon Pritchett
8 Calico Rd
West Yarmouth, MA 02673
(508) 776-3743
devon.rose.pritchett@gmail.com

From: Mass Audubon on behalf of Jennifer Santiago
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:11:52 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jennifer Santiago
24 BORDER ST
Springfield, MA 01104
(413) 652-1658
jennifer.marie2801@gmail.com

From: Mass Audubon on behalf of Kenneth Ridlon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:11:52 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Kenneth Ridlon
19 Foster Ct
Leominster, MA 01453
(508) 864-3672
thedigger5@yahoo.com

From: Mass Audubon on behalf of Lynn Adams
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:11:52 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
These ancient animals are critical to the ecosystems of the Cape Cod Bay and the Nantucket Sound marsh/estuary lands. They are not necessary in the fisheries BAIT equation, so much else is available. Enough natural selection occurs to keep the population in balance. Please change the regulations to favor these 400 million year survivors.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lynn Adams
2 Englewood Drive, B7
Harwich, MA 02645
(508) 237-9612
dahlyadams@comcast.net

From: Mass Audubon on behalf of L RILEY
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 11:11:51 AM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. L RILEY
2 Acushnet Rd
Mattapoisett, MA 02739
(774) 339-9822
lauren.riley1@yahoo.com

From: Mass Audubon on behalf of Kate Witte
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:41:49 AM

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Feb 20, 2026

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Horseshoe crabs are an incredible species! Their eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. It is imperative to reduce the annual bait harvest. Thank you for championing keystone species!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kate Witte
14 Sandy Lane
Harwich, MA 02345
(845) 608-7645
kablwi697@gmail.com

From: Mass Audubon on behalf of Kathleen Mackenzie
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:41:48 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Mackenzie
161 pond view drive
Brewster, MA 02631
(617) 750-6087
kathleenmackenz@gmail.com

From: Mass Audubon on behalf of Joanne Evans
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:11:45 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please help protect these keystone creatures and the food web they support. It really is of vital importance.

Sincerely, Joanne Evans

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Joanne Evans
25 Arbutus Rd.
Worcester, MA 01606
(774) 261-3765
jroachevansdesign@gmail.com

From: Mass Audubon on behalf of Jennifer Vizard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:11:44 AM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jennifer Vizard
24 Curtis St
Southbridge, MA 01550
(508) 561-1309
jenvizard@msn.com

From: Mass Audubon on behalf of Sheryl Becker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 10:11:44 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Sheryl Becker
142 Beekman Drive
Agawam, MA 01001
(413) 374-1921
sher1earth69@gmail.com

From: Mass Audubon on behalf of Helen Henderson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:41:44 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. It is so important that we protect horse shoe crabs now when our environment is under pressure from climate change.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Helen Henderson
512 Morton St
Stoughton, MA 02072-3252
(781) 344-9148
henderson.helen@comcast.net

From: Mass Audubon on behalf of Greg Plum
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:41:43 AM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Greg Plum
14 Wheeler Ave
Medford, MA 02155
(617) 501-9124
plumgreg@gmail.com

From: Mass Audubon on behalf of Elizabeth Ellwood
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:41:43 AM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Elizabeth Ellwood
55 Orchard Hill Drive
Sharon, MA 02067
(631) 428-8118
ellwoodlibby@gmail.com

From: Mass Audubon on behalf of Moss Cohan-Diaz
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:41:43 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Horseshoe crabs have inhabited the beaches of Massachusetts for much longer than our species has even existed. They deserve our protections from bait harvesting and biomedical harvesting.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Moss Cohan-Diaz
12
Malden, MA 02148
(414) 412-0766
gilded.lace@gmail.com

From: Mass Audubon on behalf of Jane Cleary-Kirk
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:41:43 AM

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Feb 20, 2026

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When I was a kid here on Wessagusset beach we had to walk over the horse shoe crabs and starfish to get to the water. Still living here on the water in North Weymouth and haven't seen either here in decades. I don't think my grandkids even know what they are, let alone seeing them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jane Cleary-Kirk
86 Prospect Hill Drive
North Weymouth, MA 02191
(781) 331-2680
corypheusj@comcast.net

From: Mass Audubon on behalf of Abigail Walters
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:11:41 AM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Also horseshoe crabs are dope. Let them live!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Abigail Walters
24 Centre
Canton, MA 02021
(508) 237-2471
abigail.n.walters@gmail.com

From: Mass Audubon on behalf of Haydn Goodboy
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 9:11:40 AM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
We cannot loose this ancient and interesting species to over fishing because we are only here for a limited period of time and should be able to enjoy seeing them in their natural habitats for years to come.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Haydn Goodboy
220 Dunrobin Road
Mashpee, MA 02649
(484) 582-9487
goodboyalthaydn@gmail.com

From: Mass Audubon on behalf of Daniel Hudon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:41:38 AM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

They are also evolutionary wonders that need our protection.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Daniel Hudon
31 Millmont st
Boston, MA 02119
(617) 800-3454
daniel1hudon@gmail.com

From: Mass Audubon on behalf of Bonnie Samia
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:41:37 AM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

We Need to Leave God's creatures alone THEY have a VERY crucial role in the food chain and to disrupt their role would endanger another precious creature. This needs to stop its crazy we have to protect animals when Human common sense should prevail and know its wrong and will have consequences...
PLEASE Stop This and Please make sure it's Enforced.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Bonnie Samia
168 Sutton Ave
Oxford, MA 01540
(774) 696-6171
chamberland1989@gmail.com

From: Mass Audubon on behalf of Eve Costarelli
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:41:37 AM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Eve Costarelli
16 Porter Road
Natick, MA 01760
(508) 655-2323
adamant_eve@hotmail.com

From: Mass Audubon on behalf of Micaela Quill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:41:36 AM

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Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Micaela Quill
14 Bristol Ave
Clinton, MA 01510
(508) 277-4090
mquill76@yahoo.com

From: Mass Audubon on behalf of Therese Keegan
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:41:36 AM

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Feb 20, 2026

Director Daniel McKiernan

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Therese Keegan
92 Circuit Ave
Wareham, MA 02571
(774) 319-3567
tkeegan_87@hotmail.com

From: Mass Audubon on behalf of Andrew Single
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:41:36 AM

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Feb 20, 2026

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Horseshoe crab eggs are a critical resource for migratory shorebirds as well as other coastal wildlife. Our coastal ecosystems are part of what makes the natural history of Massachusetts what it is, and we as a state should be taking more pride in that and putting more effort into preserving and protecting it.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Andrew Single
135 East Street
East Walpole, MA 02032
(508) 404-8749
asingle17@gmail.com

From: Mass Audubon on behalf of JoAnn Daigle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:11:59 AM

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Thank you for your concern and consideration.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. JoAnn Daigle
854 Broadway Unit 4
Haverhill, MA 01832
(339) 234-0159
macjbk3@aol.com

From: Mass Audubon on behalf of Lynn Chissom
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:11:35 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Lynn Chissom
673 main st
Springfield, MA 01105
(413) 675-3376
joyjoychissom@yahoo.com

From: Mass Audubon on behalf of Pamela Lowell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:11:34 AM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Please save them!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Pamela Lowell
23 Wildpepper Ln
Dartmouth, MA 02748
(401) 932-6370
palwrites@aol.com

From: Mass Audubon on behalf of Annora Haley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 8:11:34 AM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Annora Haley
72 Old Washington St
West Roxbury, MA 02339
(617) 877-4441
annoramhaley@gmail.com

From: Mass Audubon on behalf of Lori Bradley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:41:33 AM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lori Bradley
780 Reservoir Rd
North Adams, MA 01247
(508) 207-3340
loribradley@comcast.net

From: Mass Audubon on behalf of Mary-Louise Fidrych
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:41:33 AM

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Feb 20, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Horseshoe crabs were part of my childhood. As a teacher of 1st through 3rd graders I had a stuffed horseshoe crab in my classroom. How wonderful for them to see a living creature from the age of dinosaurs. Please stop harvesting them! We clever humans can find alternatives.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Mary-Louise Fidrych
21 Pine St
Westford, MA 01886
(978) 692-5674
mlfidrych@verizon.net

From: Mass Audubon on behalf of melissa dowd
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:11:32 AM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. melissa dowd
22 maple street
STURBRIDGE, MA 01566-1250
(508) 347-5086
dowds@charter.net

From: Mass Audubon on behalf of Arks Smith
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 7:11:31 AM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Arks Smith
103 Brooksby Village Drive, #102
Peabody, MA 01960
(079) 680-6808
arks18@verizon.net

From: Mass Audubon on behalf of donna cohen
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 6:41:33 AM

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Feb 20, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. donna cohen
1 Partridge rd
Hopkinton, MA 01748
(508) 555-5555
cohen96@comcast.net

From: Mass Audubon on behalf of Jan Walsh
To: Marine Fish (FWE)
Subject: Please approve DMF"s horse crab proposal
Date: Friday, February 20, 2026 6:11:28 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

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. I grew up swimming with horseshoe crabs in Dorchester Bay ! Fascinating creatures, im also an artist who paints them . They are a cure for cancer and much needed continuation for more research ! Please STOP the bait use of these wonderful creatures !

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jan Walsh
Po box 354
White Horse Beach, MA 02381
(508) 224-6330
ldybugjw@aol.com

From: Mass Audubon on behalf of Leslie Kramer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 5:11:25 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

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I urge and expect you to leave Horseshoe Crabs alone. Let them survive and rebound in sustainable numbers, not for humans, but for them as a species.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. They rely on these "crabs" for survival.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Leslie Kramer
10 Adams Street
Medford, MA 02155
(617) 872-6299
kramer.lf@gmail.com

From: Mass Audubon on behalf of Thomas Collar
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 2:11:05 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 20, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Thomas Collar
399 Market St
Rockland, MA 02370
(508) 232-5492
tcollar007@protonmail.com

From: Mass Audubon on behalf of Maya Khalil
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:10:56 AM

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Feb 19, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds, and it is vital that we protect them! Horseshoe crabs are amazing "living fossils," it would be a shame for them to go extinct after traversing the earth for so long.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maya Khalil
60 Russell Ave
Watertown, MA 02472-3455
(617) 899-9374
jeanm3649@gmail.com

From: Mass Audubon on behalf of Valerie Perini
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Friday, February 20, 2026 12:10:50 AM

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I work with kids and they love learning about horseshoe crabs. We go to the beach every day at the summer camp I run, and the kids find horseshoe crabs swimming in the shallows. Their prehistoric shape gives kids a feeling of excitement and discovery. Whoooaa!! They say a they muster the courage to pick up the crab and show their friends. Horseshoe crabs are so docile and defenseless that they are a great way to help kids learn how to safely and gently handle animals. They offer a low risk opportunity for kids to connect with nature and become familiar with handling animals

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Valerie Perini
47 JEFFREYS NECK RD
Ipswich, MA 01938
(860) 552-9127
perini.val@gmail.com

From: Mass Audubon on behalf of Jerry S McBee Jr
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 11:40:50 PM

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Feb 19, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Jerry S McBee Jr
290 State Rd Apt 1
North Adams, MA 01247
(704) 891-2439
silas45sterling@gmail.com

From: Mass Audubon on behalf of Megan Labrie
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 11:40:49 PM

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Feb 19, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Megan Labrie
94 Fedak Dr
Chicopee, MA 01013
(413) 717-0550
hello@meganalissa.com

From: Mass Audubon on behalf of Carol LeBlanc
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 11:40:49 PM

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Sincerely,

Ms. Carol LeBlanc
30 Myrtle St
Millis, MA 02054
(508) 376-2156
jaikaur@gmail.com

From: Mass Audubon on behalf of Eileen Whyte
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 11:10:51 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please protect our wildlife. It needs all the help it can get.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Eileen Whyte
119 Churchill Rd
West Springfield, MA 01089
(413) 732-1735
whyteeb@aol.com

From: Mass Audubon on behalf of Zephyrus Johnson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 11:10:49 PM

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Horseshoe crabs are essential to not just ocean life, but human life too. They're wonderful, intelligent, and unique living fossils that need to be protected for everyone- human and animal's- wellbeing. There are other sources of bait that fisheries can use that won't put this species at risk and I urge you to steer them that way. A creature that's been around as long as it has (millions of years!) deserves to continue sticking around for generations more to come.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Zephyrus Johnson
213 CHURCHILLS LN
Milton, MA 02186
(774) 404-0060
oceanchild0723@gmail.com

From: Mass Audubon on behalf of Wynn Gerhard
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 11:10:48 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Wynn Gerhard
39 Megansett dr
Plymouth, MA 02360
(617) 640-7774
wynn.gerhard@gmail.com

From: Mass Audubon on behalf of Lucius Conlin
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:40:47 PM

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Horseshoe crabs contribute more to coastal ecosystems and the fishery industry alive than as chum. A small decision here has the chance to persevere the wonder of these creatures for generations to come. Your legacy as a person who protects the vulnerable is worth more than fish bait.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Lucius Conlin
35 Jeffrey ln
Amherst, MA 01002
(413) 336-2410
lyshundpup@gmail.com

From: Mass Audubon on behalf of Rhea Vedro
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:40:45 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Rhea Vedro
58 MYSTIC ST
Medford, MA 02155
(718) 288-1923
rvedro@mit.edu

From: Mass Audubon on behalf of Laura Briggs
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:40:44 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please Support Stronger Horseshoe Crab Protections. Horseshoe crabs have always been a part of Massachusetts beaches.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Laura Briggs
22 S WIND DR
Plymouth, MA 02360
(508) 246-9232
starrynight39@verizon.net

From: Mass Audubon on behalf of Kristina Farrell
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:10:52 PM

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Sincerely,

Dr. Kristina Farrell
255 campground rd
Eastham, MA 02642
(781) 775-3647
kristina616@msn.com

From: Mass Audubon on behalf of Jessica MacManus
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:10:52 PM

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Sincerely,

Ms. Jessica MacManus
484 Franklin St
Wrentham, MA 02093
(774) 991-2275
jessicamacmanus@gmail.com

From: Mass Audubon on behalf of Shel Frolich-Tscherne
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:10:52 PM

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Sincerely,

Dr. Shel Frolich-Tscherne
100 Berlin Rd
Marlborough, MA 01752
(508) 341-4313
tschernefamily@gmail.com

From: Mass Audubon on behalf of Kris Bayne
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:10:52 PM

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As a high school science teacher working to educate blind and visually impaired students in Massachusetts, I refer to the horseshoe crab in our evolution unit. Having Horseshoe molts and exoskeletons to show the students next to fossil evidence is worth whole chapters of the textbook.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kris Bayne
59 Ellery St
Cambridge, MA 02138
(617) 233-7037
kristinabayne@gmail.com

From: Mass Audubon on behalf of Galya Assaker
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:10:52 PM

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Sincerely,

Ms. Galya Assaker
8 Captain Harris Circle
Dennis, MA 02638
(774) 994-2951
galia.mg@hotmail.com

From: Mass Audubon on behalf of Maggie Barrett
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 10:10:52 PM

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Horseshoe crabs have always been an exciting find on the beach for my family and I. I've always enjoyed moving any stranded ones back to the water or flipping them over when they're stuck on their backs. However, even with just my individual experiences on the beaches of Massachusetts, I've noticed that I don't see them much anymore. Sometimes I go a full year without seeing a single living horseshoe crab.
When I was younger, I assumed it was just bad luck and I kept missing them. However, with the bait harvest being known to bring populations down in New England more than the rest of the Atlantic coast, it's important that we can address this now and keep allowing kids to experience the joy of stumbling across such a strange and ancient creature. Massachusetts has no business falling behind on protective measures for our planet!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maggie Barrett
40 New St
Marshfield, MA 02050
(781) 563-4467
mcbarrett4467@gmail.com

From:	Mass Audubon on behalf of Shannon Mercer
To:	Marine Fish (FWE)
Subject:	Please approve DMF"s horseshoe crab proposal
Date:	Thursday, February 19, 2026 10:10:51 PM

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Sincerely,

Ms. Shannon Mercer
11 Healy Rd
Weymouth, MA 02188
(781) 812-0702
shannonm25@hotmail.com

From: Mass Audubon on behalf of Kim Houde
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:43 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I absolutely love these ancient creatures!! Please support their continued existence!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Kim Houde
50 Worcester Road
Princeton, MA 01541
(978) 464-5803
brooksfarm1773@charter.net

From: Mass Audubon on behalf of Kimberly McNamara
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:42 PM

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Sincerely,

Mrs. Kimberly McNamara
266 Elm St
Halifax, MA 02338
(617) 688-0264
kimberlyschneider22@yahoo.com

From: Mass Audubon on behalf of Grace M
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 19, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
-
Sincerely
Grace M.
Of Seekonk MA

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Grace M
80 Walnut
Seekonk, MA 02771
(978) 434-1629
mccurng@gmail.com

From: Mass Audubon on behalf of Kary Nagle
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:40 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Kary Nagle
137 Atlantic Ave
Marblehead, MA 01945
(845) 853-9923
kapardy@gmail.com

From: Mass Audubon on behalf of Lorna Weldon
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:40 PM

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WHorseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lorna Weldon
96 Sanderson Ave
Dedham, MA 02026
78q
swlwsw@verizon.net

From: Mass Audubon on behalf of Amy Perry
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:39 PM

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Feb 19, 2026

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Dear Director McKiernan,

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Their population decline is obvious everywhere along the coast that my family visits. From seeing live horseshoe crabs in abundance 20yrs ago to now only finding an abundance of dead ones along the beach. It's a rare occasion to find live ones to show our children. We need to do better to respect this beautiful species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Amy Perry
37 Brookline St
Townsend, MA 01469
(978) 460-7302
amychristineperry@gmail.com

From: Mass Audubon on behalf of Jennifer Kelly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:39 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jennifer Kelly
6 Autumn Lane
Carver, MA 02330
(617) 699-9733
jekelly14@gmail.com

From: Mass Audubon on behalf of Robert Pontbriand
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:40:38 PM

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Feb 19, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Robert Pontbriand
33 Forest Street
Dunstable, MA 01827
(978) 870-4969
rapont77@yahoo.com

From: Mass Audubon on behalf of Cathy Frary
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:10:46 PM

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Feb 19, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Additionally, they strike wonder in young and old alike. I have taken many folks on marsh walks and kayak rides. The horseshoe crabs have neber een seen by many and a total highlight for them. As a sixth grade teacher, I have brought molted shells and the remains of an expired crab into the classroom. The majority of children are unfamiliar with them. When I explain how old they are, the students are stunned.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Cathy Frary
33 Walnut St
Upton, MA 01568-1101
(508) 529-9165
cfrary@charter.net

From: Mass Audubon on behalf of Whitney Therrien
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 9:10:44 PM

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Feb 19, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. It's also insane that horseshoe crabs are being used for fish bait! It's so unnecessary for this incredibly special and unique species.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Whitney Therrien
31 Plainfield st
Boston, MA 02130
(858) 603-7589
whitney.therrien@gmail.com

From: Mass Audubon on behalf of Colleen Matthews
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:40:38 PM

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Feb 19, 2026

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Colleen Matthews
573 Beech Street
Roslindale, MA 02131
(617) 901-0333
colleenematthews@gmail.com

From: Mass Audubon on behalf of Kathleen Casey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:40:36 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Please protect these ancient creatures. Pass laws to stop the harvesting of horseshoe crabs.

Former Elementary Teacher and Reading Specialist,
Kathleen Casey

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Casey
150 Edgewater Drive East
East Falmouth, MA 02536
(508) 558-2624
kathleencasey150@yahoo.com

From: Mass Audubon on behalf of Corinne Reid
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:40:36 PM

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Horseshoe crabs are an integral part of our states ecosystem. They are also a deeply inspirational subject for the kids I teach on a daily basis. In my tenure as a teacher, each year I hear countless stories of children who were inspired to be connected to the nature in their communities because they grew up with, or visited the horseshoe crabs as children and young adults. Those children are now artists, biologists, scientists, and conservationists.

It is not at all surprising that such a special and unique animal can positively shape the experiences of so many in our state. I implore you to protect this species and relieve them of the pressures they experience outside of our rapidly changing environment.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Corinne Reid
360 Main Rd
Westhampton, MA 01027
(978) 790-0076
rinfish@gmail.com

From: Mass Audubon on behalf of Lindsey Brynjolfsson
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:40:36 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Lindsey Brynjolfsson
18 Davidson Rd
West Boylston, MA 01583
(413) 250-1280
lindseyb1177@gmail.com

From: Mass Audubon on behalf of Elizabeth Jenkins
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:10:36 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Jenkins
9 Willard Ave apt 2
Medford, MA 02155
(857) 417-6049
ejenkins10487@gmail.com

From: Mass Audubon on behalf of David Parks
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:10:36 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. David Parks
34 Glass Works Rd
Berkshire, MA 01225
(413) 822-0774
dep3wms@gmail.com

From: Mass Audubon on behalf of Kate Roper
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:10:35 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kate Roper
20 Seagrave Rd Unit D
Cambridge, MA 02140
(617) 686-0396
kateroper@aol.com

From: Mass Audubon on behalf of Stephanie Schmidt
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:10:35 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Stephanie Schmidt
2 RUSSELL TRUFANT RD
Carver, MA 02330
(508) 415-9324
schmidts128@hotmail.com

From: Mass Audubon on behalf of James Dooley
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:10:34 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. As a resident of Wareham right by Swift's Beach, I can attest to how the horseshoe crab can enrich a local ecosystem to the benefit of all.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. James Dooley
39 Shore Avenue
Wareham, MA 02571
(508) 641-5498
jackaldooley@gmail.com

From: Mass Audubon on behalf of Amy Wonkka
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 8:10:34 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Thank you very much!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Amy Wonkka
202 Day St
Leominster, MA 01453
(413) 237-4386
sethamywonkka@gmail.com

From: Mass Audubon on behalf of Cassandra Miller
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:40:37 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Plus the process of draining blood from horseshoe crabs is unnecessary and cruel.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Cassandra Miller
39 Rosewood Drive
Ipswich, MA 01938
(978) 972-1209
cassie.w.m.01938@gmail.com

From: Mass Audubon on behalf of Deborah August
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:40:33 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
I am an advocate for all animals.
I am also a Conservation Commissioner in Western MA and this issue as well as all special bills and projects to save and protect all that can be done is very important!
Thank you for doing all that you can for the shore beings.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Deborah August
21 Groveland St
Easthampton, MA 01027
(413) 527-8898
bunny01027@yahoo.com

From: Mass Audubon on behalf of DebrA Vaughad
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:40:32 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
It is hard to think that you could see horseshoe crabs and their egg cases when I was small and now it is a stroke of luck to see one. We need to be more responsive to our environment. Not just for animals but for us as people.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. DebrA Vaughad
322 Otter River Rd
Gardner, MA 01440
(978) 835-4444
vaughad@yahoo.com

From: Mass Audubon on behalf of Sheila Parks
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:40:32 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 19, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds. Protecting horseshoe crabs will not only protect these amazing prehistoric creatures but will help support migratory birds.

We need to do everything possible to protect the remaining population of horseshoe crabs.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Sheila Parks
34 Glassworks Rd
Berkshire, MA 01224
(413) 329-7881
ringoandshe@gmail.com

From: Mass Audubon on behalf of Elizabeth Clemmey
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:40:32 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
We must do everything we can to save these iconic creatures. They have been exploited for far too long. Saving wildlife and their ecosystems, saves us.

Sincerely
Elizabeth Clemmey
175 Essex Street
Mansfield Na 02048

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Elizabeth Clemmey
175 Essex St
Mansfield, MA 02048
(508) 527-1738
elizabeth@clemmey.com

From: Mass Audubon on behalf of Dominique DeMarsh
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:10:29 PM

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Feb 19, 2026

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

During my lifetime I have noticed a sharp decline in the population of horseshoe crabs.

Please consider this alternative to blue blood!

Dominique DeMarsh

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Dominique DeMarsh
39 ALLEN PL
Scituate, MA 02066
(781) 386-7141
dominiquedeshane@hotmail.com

From: Mass Audubon on behalf of Christine Ventura
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:10:28 PM

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Feb 19, 2026

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Dear Director McKiernan,

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Christine Ventura
191 Orange
Roslindale, MA 02131
(401) 203-1162
drcweiss@icloud.com

From: Mass Audubon on behalf of Diane West
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:10:28 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Diane West
7 Valerie Dr
Plainville, MA 02762
(608) 699-9239
dwlorax@gmail.com

From: Mass Audubon on behalf of Jennifer Apaldo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:10:27 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

I live on Mount Hope Bay and horseshoe crabs were regularly observed on the beaches and in the water. It has been several years since I have seen even one live horseshoe crab in Mount Hope Bay.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennifer Apaldo
112 Bay Point Road
Swansea, MA 02777
(774) 766-8199
jenwaring0116@gmail.com

From: Mass Audubon on behalf of Jennifer Koopmans
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 7:10:27 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Jennifer Koopmans
16 herring brook way
Orleans, MA 02653
(508) 364-4630
jenikoop@gmail.com

From: Mass Audubon on behalf of SUZANNE Ellis
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:28 PM

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USA we care for these creatures please do the same!!!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. SUZANNE Ellis
4 Cowen St
Fairhaven, MA 02719-3004
(508) 971-0009
nomadicstateofmind@hotmail.com

From: Mass Audubon on behalf of Nicole Schildcrout
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:27 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.
Please help save these amazing creatures. They have been around for 300 MILLION years and are essential part of our oceans ecosystem.
We are losing so much already, with the trawlers harvesting tons and tons of fish daily, the depletion of kelp forests and coral, the warming of our oceans, the dumping of plastics and other trash into our water.
We need every little bit we can save.
Thank you.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Nicole Schildcrout
115 market st
Amesbury, MA 01913
(978) 388-5369
nicole.sail@comcast.net

From: Mass Audubon on behalf of Patricia Pflaumer
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:26 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Patricia Pflaumer
5 Beebe Ln
Pembroke, MA 02359
(781) 217-4729
patriciapflaumer@gmail.com

From: Mass Audubon on behalf of Barbara Connolly
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:25 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Barbara Connolly
1 hendricks street
avon, MA 02322
(617) 997-5116
bconnolly1226@gmail.com

From: Mass Audubon on behalf of Alexe Taylor
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:25 PM

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Horseshoe crabs are a tremendous natural resource that we are depleting. Protecting them is essential to our ecosystems and should be a priority!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Alexe Taylor
85 Flint St
Salem, MA 01970
(603) 401-5114
alexetaylor1536@gmail.com

From: Mass Audubon on behalf of Martina Dahill
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:24 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Martina Dahill
103 Thaxter St
Hingham, MA 02043
(781) 267-8269
martina.dinapoli17@gmail.com

From: Mass Audubon on behalf of Alketa McManus
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:24 PM

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Sincerely,

Dr. Alketa McManus
1 middle st
Beverly, MA 01915
(978) 239-7831
abtjm@comcast.net

From: Mass Audubon on behalf of Amy DiCarlo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:40:24 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Amy DiCarlo
835 Mount Hope St Unit 51
North Attleboro, MA 02760
(774) 274-9999
acaldwell8@comcast.net

From: Mass Audubon on behalf of Jill Rossetti
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:31 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mrs. Jill Rossetti
25 Linwood Park
Brockton, MA 02301
(508) 577-2516
jmrossetti@comcast.net

From: Mass Audubon on behalf of Jill Benham
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:30 PM

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Sincerely,

Ms. Jill Benham
22 Temple Rd
Lynnfield, MA 01940
(781) 405-9062
jillb143.2023@gmail.com

From: Mass Audubon on behalf of Kathleen Travelo
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:30 PM

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Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

There should be better protection for horseshoe crabs especially after they have served their purpose in the biomedical industry and should be returned to the wild if possible and in good health for their population to recover.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Kathleen Travelo
629 setucket road
South Dennis, MA 02660
(508) 280-1476
holo.makai@gmail.com

From: Mass Audubon on behalf of Stuart Armstrong
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:30 PM

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Sincerely,

Mr. Stuart Armstrong
38 Ridge Road
Milton, MA 02186
(617) 470-8699
stuartarm@aol.com

From: Mass Audubon on behalf of Lydia Leclair
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:29 PM

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Sincerely,

Ms. Lydia Leclair
Po Box 272
Harwich, MA 02645-0272
(413) 313-3602
lydia.leclair@gmail.com

From: Mass Audubon on behalf of Christopher Gausch
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:28 PM

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Sincerely,

Mr. Christopher Gausch
41 Charles St
Whitman, MA 02382
(215) 913-4793
cgausch@hotmail.com

From: Mass Audubon on behalf of Emily Alexander
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:28 PM

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Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Emily Alexander
16 Hickory Hill Ln
Framingham, MA 01702
(774) 279-0201
emxander@gmail.com

From: Mass Audubon on behalf of Kathie Wing
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:28 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Feb 19, 2026

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Sincerely,

Mrs. Kathie Wing
53 Old Main St
Lakeville, MA 02347
(781) 223-8906
kathiewing@hotmail.com

From: Mass Audubon on behalf of Lisa Rahn
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:27 PM

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Sincerely,

Ms. Lisa Rahn
85 Church St
Fairhaven, MA 02719
(503) 338-0449
larahn@gmail.com

From: Mass Audubon on behalf of Ronda Rosenberg
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:27 PM

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Sincerely,

Mrs. Ronda Rosenberg
290 Summer St
Westwood, MA 02090
(316) 558-1717
rondarosenberg@gmail.com

From: Mass Audubon on behalf of Pamela Mansfield
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:27 PM

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It's appalling how the population of horseshoe crabs has declined. We used to see them along the shore and marsh, but it's very rare now. They was such disregard for them that they have been used for fertilizer and bait. They are so much more important to the ecological food chain and such iconic creatures. Stop giving hunters and fishers such freedom to destroy populations of animals.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Pamela Mansfield
2 Rose Ln
Gloucester, MA 01930
(978) 360-6509
pmansfield82@comcast.net

From: Mass Audubon on behalf of Catharin Taylor
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:25 PM

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Horseshoe crabs have been around for millions of years. There are an important part of the ecological web. In Sandwich Massachusetts we used to see many more horseshoe crabs than we see today it's anecdotal, but I think it shows their decreasing numbers. Please act to protect them.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Catharin Taylor
8 Jones Ln
East Sandwich, MA 02537
(513) 910-8971
crtpersonal@gmail.com

From: Mass Audubon on behalf of Emily Wood
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:25 PM

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Horseshoe crab eggs are also a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Emily Wood
171 South St
Northampton, MA 01060
(774) 212-0335
emwood26@gmail.com

From: Mass Audubon on behalf of Oz diCampanetti
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:23 PM

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Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Mr. Oz diCampanetti
501 Plantation St Apt 408
Worcester, MA 01605
(508) 239-4691
odicampanetti@gmail.com

From: Mass Audubon on behalf of Kim Granville
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Thursday, February 19, 2026 6:10:23 PM

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Sincerely,

Ms. Kim Granville
4029 Main Street, # 15
Cummaquid, MA 02637
(717) 421-7855
kim.granville@comcast.net

From: leemo1952@everyactioncustom.com on behalf of Lee Fremault
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Saturday, March 7, 2026 6:06:31 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies whose own research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jthegardener@everyactioncustom.com on behalf of Jane Contrabasso
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Friday, March 6, 2026 9:58:02 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I have been counting shorebirds that show up for horseshoe crab eggs to fuel their continued migration from South America to the Arctic breeding grounds every spring around May every year at the Delaware Bay in New Jersey and brought my grandson (who's now 19) there every year
for many years, so this issue is important to me no matter what the state.
Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether. Thank you.

From: mckenzie_b_blair@everyactioncustom.com on behalf of McKenzie Blair
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Friday, March 6, 2026 9:48:22 PM

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From: pacramer1960@everyactioncustom.com on behalf of Paul Cramer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Friday, March 6, 2026 4:25:41 PM

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From: melissa.renn@everyactioncustom.com on behalf of Melissa Renn
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Friday, March 6, 2026 3:48:11 PM

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From: blu222a@everyactioncustom.com on behalf of Jeff Gifford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Friday, March 6, 2026 1:05:16 PM

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From:	wn.brown@everyactioncustom.com on behalf of Wayne Brown
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Friday, March 6, 2026 7:19:40 AM

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From: jpfeifferrios@everyactioncustom.com on behalf of Jan Pfeiffer-Rios
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Friday, March 6, 2026 6:35:25 AM

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Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: encyclopedicgirl@everyactioncustom.com on behalf of Fionnuala Gerrity
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 9:08:54 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: tholl.jonathan@everyactioncustom.com on behalf of Jonathan Tholl
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 8:35:58 PM

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From: cg.whitehead@everyactioncustom.com on behalf of Chris Whitehead
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 7:09:38 PM

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From: blu222a@everyactioncustom.com on behalf of Jeff Gifford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 3:48:00 PM

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From: mgard62@everyactioncustom.com on behalf of Mary Gard
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 2:07:20 PM

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From: ruthmeln@everyactioncustom.com on behalf of Ruth Melnick
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 12:38:35 PM

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From: Kialikethecar@everyactioncustom.com on behalf of Kia Ruscansky
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 10:57:01 AM

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From: alyalove@everyactioncustom.com on behalf of Alyssa Lovell
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 10:07:25 AM

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From: fontaineangela7@everyactioncustom.com on behalf of Angela Fontaine
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Thursday, March 5, 2026 6:41:58 AM

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From: niranjantg@everyactioncustom.com on behalf of Niranjan Thiruvur
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 8:35:21 PM

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From: jnheuer@everyactioncustom.com on behalf of Jennifer Heuer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 8:33:33 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

Some of my earliest memories are of seeing horseshoe crabs; threats to their viability are thus especially meaningful to me. And make no mistake, the proposed increase is a real threat.

Here are some of the details: The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: sdean33@everyactioncustom.com on behalf of Shelagh Dean
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 8:16:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies whose own research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	jocon1029@everyactioncustom.com on behalf of Joanne Conti
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Wednesday, March 4, 2026 7:17:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: pocachade666@everyactioncustom.com on behalf of DEB CHASE
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 7:08:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	kjh361@everyactioncustom.com on behalf of Karin J Hemmingsen
To:	Marine Fish (FWE)
Subject:	WHAT IS THE MATTER WITH YOU PEOPLE? Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Wednesday, March 4, 2026 7:06:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

As a nearly 63 year resident of Massachusetts and as a lover of our state's lands and waters and the life they sustain, I am asking you please to withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival. SO NOW EVIDENTLY THIS STATE WANTS TO BE A NAIL IN THE COFFIN OF A SPECIES THAT SURVIVED METEORS, CLIMATE CHANGES, ETC., ETC.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' totally dishonest and hypocritical rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a grotesque loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies WHOSE OWN RESEARCH SHOWS we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

This proposal places antediluvian Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends. WHAT IS THE MATTER WITH THIS PICTURE?

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: wolfsheimat@everyactioncustom.com on behalf of Steven Wychor
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 6:29:03 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: blueiris87@everyactioncustom.com on behalf of Emily Ross
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 6:18:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jillnjay@everyactioncustom.com on behalf of Jill Silvia
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 5:27:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	banokomis1@everyactioncustom.com on behalf of Barbara Whitehair
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Wednesday, March 4, 2026 5:06:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: ipenrym2020@everyactioncustom.com on behalf of Irene Murphy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 4:57:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: kareneglover@everyactioncustom.com on behalf of Karen Glover
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 4:21:03 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

The continued use of animal testing when better alternatives exist is unconscionable.

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: marc.melinkoff@everyactioncustom.com on behalf of Marc Melinkoff
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 3:31:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: EAlfanopav@everyactioncustom.com on behalf of Elizabeth Alfano-Pavidapha
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 3:09:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: dsfowler45@everyactioncustom.com on behalf of David Fowler
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 2:50:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: inside-dawn7m@everyactioncustom.com on behalf of Wenifred Watson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 2:03:51 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: rolevey52@everyactioncustom.com on behalf of Roberta Levey Scrivner
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 1:44:19 PM

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And, for simply selfish reasons, I have been enjoying seeing horseshoe crabs in MA since the 1980's and would hate to think that my state government is facilitating their demise.

From: robvan56@everyactioncustom.com on behalf of Rob Vandenabeele
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 12:34:51 PM

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From:	klord3@everyactioncustom.com on behalf of Kathryn Lord
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Wednesday, March 4, 2026 12:11:37 PM

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From:	bmcdonoughh@everyactioncustom.com on behalf of Brad McDonough
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Wednesday, March 4, 2026 12:09:30 PM

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From: rae.most@everyactioncustom.com on behalf of Rachel Most
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 11:27:55 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: stafford@everyactioncustom.com on behalf of Sue Stafford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 10:49:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I'm writing to you about the horseshoe crabs. With a synthetic alternative approved and available, there's absolutely no justification for increasing the allowable limit on the catch indeed, it should be just the opposite - limit the catch even further.

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: bonniejeanne2002@everyactioncustom.com on behalf of Bonnie Seliger
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 10:32:09 AM

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From: reginadentremont@everyactioncustom.com on behalf of Regina Charles
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 10:20:18 AM

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From:	chrisbeaudry@everyactioncustom.com on behalf of christine beaudry
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Wednesday, March 4, 2026 9:44:32 AM

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From: jguido6@everyactioncustom.com on behalf of Julie Guido
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 9:02:03 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: 129.jwatts@everyactioncustom.com on behalf of Jill Watts
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 7:43:12 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: littlefish1222@everyactioncustom.com on behalf of Kayla Salmon
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 6:38:21 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: marcusperez824@everyactioncustom.com on behalf of Marcus Perez
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Wednesday, March 4, 2026 12:39:23 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: ken_reeves@everyactioncustom.com on behalf of Ken Reeves
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:26:30 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: lekeith8@everyactioncustom.com on behalf of Lindsay Keith
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:15:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jritter3@everyactioncustom.com on behalf of Jan Ritter
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:15:06 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: cfnealy@everyactioncustom.com on behalf of Carol Nealy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:02:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. Neighboring states have already banned any catch!

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From: ericbaratta@everyactioncustom.com on behalf of Eric Baratta
To: Marine Fish (FWE)
Subject: Please Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:20:31 PM

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From: beecofriendly@everyactioncustom.com on behalf of K G
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:16:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: zotlocker@everyactioncustom.com on behalf of Robert Webster
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:02:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Sincerely,
Robert L. Webster
01540

From: lyonsj723@everyactioncustom.com on behalf of Jenna Lyons
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:44:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jmmermaid@everyactioncustom.com on behalf of Janet MacCausland
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:26:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: totoabby11@everyactioncustom.com on behalf of Shirley Scott
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:22:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	pmcduff13@everyactioncustom.com on behalf of Patrick McDuff
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 7:08:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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From: pepabrazil@everyactioncustom.com on behalf of Catherine Brazil
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:16:02 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: ktperera5@everyactioncustom.com on behalf of Katherine Patterson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:40:20 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. I spend every summer walking out on the flats in Barnstable Harbor, and have seen the populations fluctuate. These are incredibly special animals, and still need to be protected.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: carajdb@everyactioncustom.com on behalf of Cara dos Santos-Becker
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:35:40 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: jakependlebury26@everyactioncustom.com on behalf of Jacob Pendlebury
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:18:03 PM

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From: amyrealmccoy@everyactioncustom.com on behalf of Amy McCoy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:12:31 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: carolardito@everyactioncustom.com on behalf of Carol Amato
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:09:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: carolardito@everyactioncustom.com on behalf of Carol Amato
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:07:42 PM

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From: christine.amisano@everyactioncustom.com on behalf of Christine Amisano
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:04:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: grahambeth76@everyactioncustom.com on behalf of Beth Graham
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:01:54 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: lindathompson404@everyactioncustom.com on behalf of Linda Thompson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:52:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: dtsitsos@everyactioncustom.com on behalf of Dianne Tsitsos
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:49:19 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I know this must seem like a niche issue, but it is not. These humble but ancient beings are subject to abusive biomedical practices, while there are synthetic tests that accomplish the same ends. I saw a photo of one of the extraction labs with rows of crabs affixed to supports while they are bled. It was horrifying and utterly unnecessary. Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: harveysh.lee@everyactioncustom.com on behalf of Harvey S. Lee
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:40:44 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

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From: biodiversityforevernj@everyactioncustom.com on behalf of Nancy Putnam
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:31:45 PM

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From: sbc@everyactioncustom.com on behalf of David and Susan Clark
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:21:01 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

It seems utterly wrong to allow such ancient and resilient creatures to be extirpated for any reason, even if the goal is medical research. And new advances make horseshoe rap blood no longer necessary. Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From:	irene.sedlacko@everyactioncustom.com on behalf of Irene Sedlacko
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 4:18:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: ed78wnb9@everyactioncustom.com on behalf of edgar roca
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:12:58 PM

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To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:12:27 PM

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From: gilpayson@everyactioncustom.com on behalf of Gilbert Payson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:09:52 PM

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From:	maximsmom@everyactioncustom.com on behalf of Teresia LaFleur
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 4:01:15 PM

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From: judy.desreuisseau@everyactioncustom.com on behalf of Judy Desreuisseau
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:32:56 PM

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From: rclayg07@everyactioncustom.com on behalf of Richard Gilson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:30:01 PM

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From: pilarandisabel@everyactioncustom.com on behalf of Pilar Quintana
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:26:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: century93@everyactioncustom.com on behalf of Jennifer D"Angelo
To: Marine Fish (FWE)
Subject: Please withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:09:33 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: bennettchcp@everyactioncustom.com on behalf of Edward Bennett
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:08:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: junecraigen@everyactioncustom.com on behalf of June Craigen
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:04:17 PM

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From: lisa.contarino@everyactioncustom.com on behalf of Lisa Contarino
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:59:45 PM

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From: g23lion@everyactioncustom.com on behalf of Joanne Main
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:59:02 PM

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From: jamzac@everyactioncustom.com on behalf of James Hadcroft
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:53:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. There are alternatives available these days.

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Please know that we stand together on this. James K. Hadcroft here. You are part of the solution. Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: bane962@everyactioncustom.com on behalf of Brad Fredriksen
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:48:02 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: renelle.hebert@everyactioncustom.com on behalf of Renelle Hebert
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:48:02 PM

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From: morris64@everyactioncustom.com on behalf of Susan Morris
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:44:28 PM

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From: bevtrixxi@everyactioncustom.com on behalf of Bev Santaniello
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:32:22 PM

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From: fannynlwhitman@everyactioncustom.com on behalf of Fanny Whitman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:27:25 PM

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From: janebluebird8@everyactioncustom.com on behalf of Jane Robie
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:24:32 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: lizpease@everyactioncustom.com on behalf of Liz Pease
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:19:32 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: rbtmosher109@everyactioncustom.com on behalf of Robert Mosher
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:09:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jmckbrewer@everyactioncustom.com on behalf of Judy Brewer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:08:48 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. There are very reasonable alternatives for all of their "uses" except for their rightful place in the ecosystem and in support of migrating birds via their eggs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission. This is irresponsible and absurd.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies whose own research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: hudson_kim@everyactioncustom.com on behalf of Kim Hudson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:06:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: susanartz@everyactioncustom.com on behalf of Susan Anderson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:06:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: robgough333@everyactioncustom.com on behalf of Rob Gough
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:04:09 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Horseshoe crabs are a keystone species within our coastal ecosystem, and demand stronger conservation efforts here in Massachusetts. Please withdraw the proposed increase in the Commonwealth's biomedical catch quota for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jeanw43@everyactioncustom.com on behalf of Jean Williams
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 2:01:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: paul_m_obrien@everyactioncustom.com on behalf of Paul OBrien
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:58:24 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: svp01040@everyactioncustom.com on behalf of Susan VanPelt
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:45:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: masshumane@everyactioncustom.com on behalf of Joanne MAINIERO
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:32:11 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: richardtoole@everyactioncustom.com on behalf of richard toole
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:26:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jdg1102@everyactioncustom.com on behalf of James Gifford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:26:07 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: shawnsargent2000@everyactioncustom.com on behalf of Shawn Sargent
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:23:24 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: woofmeowsit@everyactioncustom.com on behalf of Mary Vitro
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:09:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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From: carrieth59@everyactioncustom.com on behalf of Carrie Thomas
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:48:50 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: aem1130@everyactioncustom.com on behalf of Amy Morgan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:46:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: singingalltheway@everyactioncustom.com on behalf of Marianne L"Abbate
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:44:09 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: Cobra3327@everyactioncustom.com on behalf of James Hutchison
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:39:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: maczdaddy9@everyactioncustom.com on behalf of Carl E. Hartdegen
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:38:31 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: arlenebutters@everyactioncustom.com on behalf of Arlene Butters
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:37:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: drudavsky@everyactioncustom.com on behalf of Dahlia Rudavsky
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:31:10 PM

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From: reiter@everyactioncustom.com on behalf of Deborah Reiter
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:29:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: reerooney41@everyactioncustom.com on behalf of Rita Rooney
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:24:44 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: fweinstein58@everyactioncustom.com on behalf of Frieda Weinstein Biton
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:24:14 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: kwg@everyactioncustom.com on behalf of Marty Grundy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:16:08 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

Growing up, a family trip to the seashore included looking foreward to seeing horseshoe crabs. The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival. Why are you pushing to kill more of these creatures? Is this as "transaction" with lobbies?

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission. There are alternatives for bait.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: otisesq77@everyactioncustom.com on behalf of Gail Otis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:04:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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From: stephanie.marco@everyactioncustom.com on behalf of Stephanie Marco
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:58:31 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: lindabbc@everyactioncustom.com on behalf of Linda Babcock
To: Marine Fish (FWE)
Subject: protection needed for horseshoe crabs in Massachusetts beaches
Date: Tuesday, March 3, 2026 11:55:09 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Too many have been killed -- their function in aquatic ecosystems are essential and from Massachusetts beaches they need not be taken and killed for biomedical research. Alternative solutions for their blood are animal free synthetic substances.

An example of their place in the ecosystem: migrating birds, such as the Red Knot (Calidris canutus), feed on their eggs in preparation for long migration flights from South American to their breeding site in the arctic.

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

Please enable these imperiled creatures to thrive: not be killed for laboratory research and testing.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: calico13cm@everyactioncustom.com on behalf of cheryl Minieri
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:53:15 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: susan@everyactioncustom.com on behalf of Susan Elam
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:41:22 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: love.rose.opal@everyactioncustom.com on behalf of Kimberly Cummings
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:35:16 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: henryjdarrell@everyactioncustom.com on behalf of Henry Darrell
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:33:14 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	cbishopma@everyactioncustom.com on behalf of Carolyn Bishop
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 11:22:17 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

PLEASE withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: enviroshow@everyactioncustom.com on behalf of Enviro Show
To: Marine Fish (FWE)
Subject: No proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:21:40 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Time to withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: veigalm8@everyactioncustom.com on behalf of Linda Veiga
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:18:53 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: mjmerrill@everyactioncustom.com on behalf of Michael Merrill
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:17:00 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: egodena@everyactioncustom.com on behalf of Ellen Godena
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:16:13 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: saucemops@everyactioncustom.com on behalf of B Coniglio
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:15:59 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

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From: angela@everyactioncustom.com on behalf of Angela Alston
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 11:10:53 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

As a US citizen and resident of Massachusetts, I urge you to withdraw the proposed increase in the biomedical catch quota for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by over-harvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: nancyhallbrooks@everyactioncustom.com on behalf of Nancy Brooks
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:48:15 AM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	chercrow@everyactioncustom.com on behalf of Cherrie Higgins
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 10:46:20 AM

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Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	ben_brooks@everyactioncustom.com on behalf of Ben Brooks
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 10:40:07 AM

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Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: carolfosterworld@everyactioncustom.com on behalf of Carol Foster
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:39:44 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: r87933@everyactioncustom.com on behalf of Marcia Ciro
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:39:14 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. USE ALTERNATIVES!

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: ncarbullido@everyactioncustom.com on behalf of Natalia Carbullido
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:21:53 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: borreroshirley@everyactioncustom.com on behalf of Shirley Borrero
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:15:03 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: valeriemajor@everyactioncustom.com on behalf of Valerie Wisniewski
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:09:43 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: bowlingforwaffles@everyactioncustom.com on behalf of Margaret Eells
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 10:04:56 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	heathergraf1@everyactioncustom.com on behalf of Heather Graf
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 9:58:02 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: pammy57@everyactioncustom.com on behalf of Pamela Lyons
To: Marine Fish (FWE)
Subject: Please Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:57:17 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

This is very important! Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies whose own research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: mjscheier67@everyactioncustom.com on behalf of Michelle Scheier
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:40:34 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: lgough0616@everyactioncustom.com on behalf of Lisa Gough
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:39:58 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: pamnesshd@everyactioncustom.com on behalf of Pamela Harbeson-DePew
To: Marine Fish (FWE)
Subject: Save Horseshoe Crabs!
Date: Tuesday, March 3, 2026 9:38:46 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. A higher catch quota is not needed given advancements in science that create synthetic substitutes.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs. We should be joining in the efforts of Connecticut and New York and further limiting or even banning these harvests.

This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: kendalltayers@everyactioncustom.com on behalf of Kendall Ayers
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:37:47 AM

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Dear Massachusetts Division of Marine Fisheries,

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: sbrydges@everyactioncustom.com on behalf of Sara Brydges
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:33:43 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: ynata2000@everyactioncustom.com on behalf of Natali Y
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:33:43 AM

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From: hlexi99@everyactioncustom.com on behalf of Kelly Herrera
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:28:26 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: lovebird8@everyactioncustom.com on behalf of Lisa Ruokis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:27:43 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

Thank you!

From: jlhiggins49@everyactioncustom.com on behalf of Janis Higgins
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:23:39 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: oldtreehuggerforlife@everyactioncustom.com on behalf of Peggy Kocoras
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:20:05 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	rraslavsky@everyactioncustom.com on behalf of Robert Raslavsky
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 9:17:01 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	spoff77@everyactioncustom.com on behalf of Kurt Hirschenhofer
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 9:16:32 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: pjc3@everyactioncustom.com on behalf of Jonna Cohane
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:13:55 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: framarjen@everyactioncustom.com on behalf of Frank King
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:09:04 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: prendergastnancy@everyactioncustom.com on behalf of Nancy Prendergast
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:08:02 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: rqe_lks@everyactioncustom.com on behalf of Robin Evans
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:05:56 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I live on Cape Cod. I find it unconscionable that you would push to the very limit of its viability a species so endemic to the cape. Please be courageous enough to halt this proposition.
Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: jpg1002@everyactioncustom.com on behalf of Jill Geibel
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 9:04:31 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: smgriffin77@everyactioncustom.com on behalf of Shannon Griffin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:59:09 AM

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From: ktjd@everyactioncustom.com on behalf of Kathleen Vorce
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:56:46 AM

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From: lucipurrkat@everyactioncustom.com on behalf of Sha Bee
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:56:31 AM

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From: bwheatley24@everyactioncustom.com on behalf of Benjamin Wheatley
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:55:32 AM

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From: powell.m11@everyactioncustom.com on behalf of Margaret powell
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:53:30 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: margiedp@everyactioncustom.com on behalf of Marguerite Doyle
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:50:58 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jestbeers1@everyactioncustom.com on behalf of Judith Beers
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:49:50 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: loulabellesimmons7@everyactioncustom.com on behalf of Loki Simmons
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:49:31 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: efmiller2@everyactioncustom.com on behalf of Sheila Miller
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:49:30 AM

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Kind Regards,
Sheila Miller

From: tom_in_davis_square@everyactioncustom.com on behalf of Thomas King
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:43:38 AM

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From: martsilb@everyactioncustom.com on behalf of Martin Silberberg
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:41:32 AM

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From:	kdanetteross@everyactioncustom.com on behalf of Karen Ross
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 8:32:21 AM

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From: parodriguezc@everyactioncustom.com on behalf of Pedro Rodriguez
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:30:02 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: shelleyhartz@everyactioncustom.com on behalf of Shelley Hartz
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:29:04 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jshop211@everyactioncustom.com on behalf of Jane Luu
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:28:22 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	richhassinger@everyactioncustom.com on behalf of Richard Hassinger
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 8:23:50 AM

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From: bruceolson123@everyactioncustom.com on behalf of Bruce Olson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:21:34 AM

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From: sprigney.97@everyactioncustom.com on behalf of Sean Rigney
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:18:10 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: smithmb@everyactioncustom.com on behalf of Meg Smith
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:14:27 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	smithmb@everyactioncustom.com on behalf of Scott Smith
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 8:14:07 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: caoneil@everyactioncustom.com on behalf of Carol O"Neil
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:13:33 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: gene4deb@everyactioncustom.com on behalf of Eugene Brusin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:11:49 AM

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From: ljohay@everyactioncustom.com on behalf of Libby Haycock
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:11:32 AM

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From: michael.raponi@everyactioncustom.com on behalf of Michael Raponi
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:07:52 AM

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From: jimandlaur@everyactioncustom.com on behalf of Laurie Denis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:06:49 AM

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From: amiddlet7@everyactioncustom.com on behalf of Antonia Middleton
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:00:37 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: kbbaries@everyactioncustom.com on behalf of Kristine Beebe
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 8:00:06 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: psytrance1968@everyactioncustom.com on behalf of MARTIN DU PLESSIS
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:58:14 AM

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From: blacksheepinn@everyactioncustom.com on behalf of Andrew Hammerman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:48:55 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I have walked beaches for many years and have seen the decline in horseshoe crabs.

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From: Tigermugsy@everyactioncustom.com on behalf of Jonathan Millman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:48:28 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: mtm277@everyactioncustom.com on behalf of Maria Mongiat
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:45:15 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: gkfrank91@everyactioncustom.com on behalf of Genevieve Frank
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:42:37 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: alexandra_corwin@everyactioncustom.com on behalf of Alexandra Corwin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:40:41 AM

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From: kathleen@everyactioncustom.com on behalf of Kathleen Medina
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:40:12 AM

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From: kittyhawk12348@everyactioncustom.com on behalf of Deirdre Morris
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:37:58 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: bain006@everyactioncustom.com on behalf of William Bain
To: Marine Fish (FWE)
Subject: Please don"t increase the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:37:55 AM

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From:	mmccarthy15@everyactioncustom.com on behalf of Michael McCarthy
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 7:36:33 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: mgpannill@everyactioncustom.com on behalf of Greyson Pannill
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:36:27 AM

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From:	sholland0206@everyactioncustom.com on behalf of Susan Holland
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 7:35:11 AM

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From: karen.burns63@everyactioncustom.com on behalf of Karen Burns
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:34:27 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: mike_mccool@everyactioncustom.com on behalf of Mike McCool
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:30:27 AM

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From: mhchisholm9@everyactioncustom.com on behalf of Margaret Chisholm
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:29:25 AM

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From: iknudson@everyactioncustom.com on behalf of Inge Knudson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:24:08 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

As a longtime Massachusetts resident and retired clinical researcher, I'm asking you to please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership, and I am proud of my state's leadership in these areas. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: john.hess@everyactioncustom.com on behalf of John Hess
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:22:26 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: renmalkus@everyactioncustom.com on behalf of Karen Malkus-Benjamin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:19:41 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe.
Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.
In Pleasant Bay the number of young horseshoe juveniles has dropped dramatically since I was young in the 1960's. We have been counting each season and are shocked at how few are seen in recent years.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.
Thank you for your consideration and your work!

From: danalbarry@everyactioncustom.com on behalf of Dana Barry
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:11:38 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: fedorsky@everyactioncustom.com on behalf of Catherine Fedorsky
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:07:10 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: attycanty@everyactioncustom.com on behalf of Ken Canty
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:06:33 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: chrisogahan@everyactioncustom.com on behalf of Chris O"Gahan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:05:04 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jsalmanowicz@everyactioncustom.com on behalf of Jordan Longever
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 7:03:25 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: danalbarry@everyactioncustom.com on behalf of Dana Barry
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:47:19 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	ilanaschoen@everyactioncustom.com on behalf of Ilana Schoenfeld
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 6:42:09 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: susan.a.clark@everyactioncustom.com on behalf of Susan CLARK
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:38:21 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: brat8311@everyactioncustom.com on behalf of Maressa B
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:35:14 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jbandola@everyactioncustom.com on behalf of Jodi Bandola-Marks
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:30:49 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: susituson@everyactioncustom.com on behalf of Susi Westwood
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:29:07 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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From: queyma@everyactioncustom.com on behalf of M A
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:22:29 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: ann@everyactioncustom.com on behalf of Ann Sweeten
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:21:13 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: mariaelvira631@everyactioncustom.com on behalf of Mari Elvi
To: Marine Fish (FWE)
Subject: A backward proposal to ditch. Keep horseshoe crab free from biomedical use
Date: Tuesday, March 3, 2026 6:20:56 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

On 2026, one expects not to increase but to put an end the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by over harvesting in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: goodendings@everyactioncustom.com on behalf of Donalyn Gross
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:11:08 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: rickim2@everyactioncustom.com on behalf of Richard and Kim Rendigs
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:04:29 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: JessAwBryant@everyactioncustom.com on behalf of Jessica Bryant
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 6:00:20 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: fwilliams@everyactioncustom.com on behalf of Freddie Williams
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota, without delay.
Date: Tuesday, March 3, 2026 5:55:04 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I agree with all of the following:

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: purpledog1822@everyactioncustom.com on behalf of Bridget J Dunford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:50:32 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: ccosgrove06@everyactioncustom.com on behalf of Christopher Cosgrove
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:48:57 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: dmadams28@everyactioncustom.com on behalf of David Adams
To: Marine Fish (FWE)
Subject: Please Withdraw Proposed Increases in the Horseshoe Crab Biomedical Harvest Quota
Date: Tuesday, March 3, 2026 5:31:20 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Dear Director and Members of the Division of Marine Fisheries,

I am writing to respectfully urge you to withdraw the proposed increases in the horseshoe crab biomedical harvest quota.

Horseshoe crabs are an extraordinary and ancient species that play a vital role in Massachusetts' coastal ecosystem. Over the past several decades, their populations have declined significantly. Increasing harvest pressure now — even for biomedical purposes — risks further weakening a species that is already under stress.

I recognize the importance of protecting human health and ensuring safe drug testing. However, synthetic, animal-free alternatives such as recombinant Factor C have been approved by U.S. regulators and are increasingly used by manufacturers. Given the availability of these alternatives, Massachusetts should be accelerating the transition away from reliance on wild horseshoe crabs, not expanding the number that can be captured and bled.

This issue also affects the broader ecosystem. Horseshoe crab eggs are a critical food source for migrating shorebirds, including the federally threatened red knot. As environmental pressures mount from climate change and habitat loss, it is especially important to avoid adding preventable stress to species that underpin coastal food webs.

Massachusetts has long been a leader in science-based resource management. With neighboring states strengthening protections, I urge the Division to demonstrate similar leadership by withdrawing the proposed quota increase and prioritizing conservation and transition to animal-free testing methods.

Thank you for your consideration and for your stewardship of our marine resources.

David

From: marie-laurence.yans@everyactioncustom.com on behalf of Marie-Laurence Yans
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:25:19 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: jmb_01550@everyactioncustom.com on behalf of Justin Bernard
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 5:25:04 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies whose own research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: swampgal3@everyactioncustom.com on behalf of Sandra Saunders
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota that kill our resources.
Date: Tuesday, March 3, 2026 5:21:22 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.
I have seen the radical decline in the horseshoe population over the last 2 decades. Very few come in on the bay side of Cape Cod. In the 1960s their arrival was spectacular.
It is not necessary to bleed the crabs, their are synthetic substances now that can replace the horseshoe crab blood in safety testing of medical equipment. I believe these synthetics are used in Europe.
No one or no company has the right to squander our resources, It is embarrassing that Massachusetts is so behind in passing protection measures where other New England states have done so. The American horseshoe crab has survived 450 million years multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: eruegseg@everyactioncustom.com on behalf of Elizabeth Ruegsegger
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:46:28 AM

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Dear Massachusetts Division of Marine Fisheries,

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From: noreenmich14@everyactioncustom.com on behalf of Noreen Michaud
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:45:24 AM

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Dear Massachusetts Division of Marine Fisheries,

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: stb7@everyactioncustom.com on behalf of Santi Britt
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:20:00 AM

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Dear Massachusetts Division of Marine Fisheries,

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Already, biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% or more of the crabs die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

Also, Massachusetts' rent-a-crab program, which routes bait-designated crabs to biomedical bleeding labs first, creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: altheath@everyactioncustom.com on behalf of Heather Clark
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:19:58 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: lstarseed@everyactioncustom.com on behalf of Lozz Starseed
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:09:51 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: lozzie666@everyactioncustom.com on behalf of Lozz Starseed
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:09:29 AM

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Dear Massachusetts Division of Marine Fisheries,

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From:	maximsmom@everyactioncustom.com on behalf of Teresia LaFleur
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Tuesday, March 3, 2026 4:07:29 AM

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From: jenlovesanimals42@everyactioncustom.com on behalf of JENNIFER DIGIACOMO
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 4:04:25 AM

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From: jodiatkinson001@everyactioncustom.com on behalf of Jodi Atkinson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:08:21 AM

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From: msblizzypriss@everyactioncustom.com on behalf of Christine M Piekarski
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:00:49 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: mhodges706@everyactioncustom.com on behalf of Mark Hodges
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:00:17 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: alamonica389@everyactioncustom.com on behalf of Anthony Lamonica
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 3:00:15 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: wcplvpa@everyactioncustom.com on behalf of Wayne Cohen
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:46:56 AM

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From: tsarina@everyactioncustom.com on behalf of Tsar Fedorsky
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 1:44:46 AM

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From: fludwig12@everyactioncustom.com on behalf of Fran Ludwig
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:47:14 AM

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ALTERNATIVES EXIST. STOP HARMING THE ECOSYSTEM.

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From: janevieira@everyactioncustom.com on behalf of Jane Vieira
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:28:51 AM

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From: psadlierbosox@everyactioncustom.com on behalf of Peter Sadlier
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:07:12 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: lorainesnooks@everyactioncustom.com on behalf of Laraine Snooks
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Tuesday, March 3, 2026 12:02:39 AM

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From: rlegault@everyactioncustom.com on behalf of Richard Legault
To: Marine Fish (FWE)
Subject: Please withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:53:13 PM

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From: horsefeatherz@everyactioncustom.com on behalf of Horse Featherz
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:50:01 PM

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From: jillianmegan45@everyactioncustom.com on behalf of Jillian Perkins
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:47:58 PM

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Massachusetts prides itself on conservation and scientific leadership. As an environmental science professional, the conservation of this species is even more so important as I continue to further my career through coastal habitat restoration efforts, which inevitably includes the wellbeing of horseshoe crabs. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	amazip@everyactioncustom.com on behalf of Carolyn Richards
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 11:44:14 PM

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From: susanjferrer@everyactioncustom.com on behalf of Susan Ferrer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:35:40 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: hecate222@everyactioncustom.com on behalf of Anne Zepernick
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:33:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: robinsteeves@everyactioncustom.com on behalf of Robin Steeves
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:32:39 PM

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From: carlsten86@everyactioncustom.com on behalf of Satu Carlsten
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:28:19 PM

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From: sherrylw9@everyactioncustom.com on behalf of Sherry Weiland
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:15:22 PM

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From: jmantak@everyactioncustom.com on behalf of Jon Mantak
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:05:15 PM

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From: moss@everyactioncustom.com on behalf of Eliot Moss
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:04:35 PM

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From: SHallor@everyactioncustom.com on behalf of Sara Hallor
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 11:01:58 PM

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From: jsuemaynard@everyactioncustom.com on behalf of Julia Maynard
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:59:42 PM

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From: slowmoose@everyactioncustom.com on behalf of Marcia Sporny
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:58:11 PM

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From: vjastromb@everyactioncustom.com on behalf of Virginia Jastromb
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:56:37 PM

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From: climbnyogi@everyactioncustom.com on behalf of Tracy Revett
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:55:19 PM

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From: trexleralice@everyactioncustom.com on behalf of alice trexler
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:55:01 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: ledzim67@everyactioncustom.com on behalf of Leda Zimmerman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:54:29 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: angelica.fenner@everyactioncustom.com on behalf of Angelica Fenner
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:52:23 PM

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From: digitalsonic@everyactioncustom.com on behalf of S. Robertson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:43:51 PM

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From: jacq23400@everyactioncustom.com on behalf of Jacquelyn Schmidt
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:42:39 PM

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From: alahaie.30@everyactioncustom.com on behalf of Ann Marie Lahaie
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:40:05 PM

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From: sbraoudakis@everyactioncustom.com on behalf of Spyros Braoudakis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:38:56 PM

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From: ljbarnes116@everyactioncustom.com on behalf of Lori Barnes
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:37:03 PM

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From:	mrbristle@everyactioncustom.com on behalf of Peter Kahigian
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 10:32:09 PM

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From: joeofny73@everyactioncustom.com on behalf of David Dragon
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:31:28 PM

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From: dsfowler45@everyactioncustom.com on behalf of David Fowler
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:30:33 PM

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From:	brn57@everyactioncustom.com on behalf of Barbara Nathanson
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 10:30:30 PM

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From: vlasopolos@everyactioncustom.com on behalf of Anca Vlasopolos
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:30:28 PM

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Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	maryanna@everyactioncustom.com on behalf of MaryAnna Foskett
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 10:30:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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From: jpl92077@everyactioncustom.com on behalf of Jaremy Lynch
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:29:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	altahhan@everyactioncustom.com on behalf of albert tahhan
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 10:27:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: osugrad124@everyactioncustom.com on behalf of Keren Kumar
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:26:03 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: gumabby@everyactioncustom.com on behalf of Kevin-Scott Crawford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:24:30 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: Kuchinsky.Renata@everyactioncustom.com on behalf of Renata Kuchinsky
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:24:03 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: marlynmiller@everyactioncustom.com on behalf of Marlyn Miller
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:23:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: tasharobbins22@everyactioncustom.com on behalf of Priscilla Robbins
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:21:29 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: Kagami216@everyactioncustom.com on behalf of Anjulia Rider
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:20:55 PM

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From: kmartakos@everyactioncustom.com on behalf of Karen Martakos
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:15:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: m.w.blackburn@everyactioncustom.com on behalf of Mary Blackburn
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:15:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

We need to stop lagging behind Connecticut and New York as far as horseshoe crab protections. Do not increase the horseshoe crab catch. My twelve year old says “please just look at the science. This blood isn’t medically necessary anymore because there are synthetic alternatives. It isn’t needed to save human lives anymore, so let’s save horseshoe crab lives.”

If a twelve year old can read through the data and understand this, this division can as well and act to protect our resources.

They do not belong to companies. The profit is not sustainable. But a healthy ecosystem will sustain all of us.

From: ruthcopeland@everyactioncustom.com on behalf of Ruth Copeland
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:13:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

Massachusetts, my state, prides itself on conservation and scientific leadership. I urge the division to prioritize conservation and science by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives, by implementing plans to phase out the catch altogether.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by over-harvest in the 1980s and 1990s. Populations remain seriously depleted in our state. Increasing the catch will further threaten the species' survival.

Biomedical harvests of horseshoe crabs have already more than doubled in the past six years: more than 1 million crabs annually according to the Atlantic States Marine Fisheries Commission!

Independent studies show that 30% or more of the crabs perish as a result of the bleeding process or suffer significant sub-lethal effects that impair their ability to spawn.

And another program creates a loophole that obscures the scale of the catch. The rent-a-crab program, which routes bait-designated crabs to biomedical bleeding labs first, adds an additional 100,000 crabs to the blood-harvest total -- a staggering number that undermines conservation goals.

Massachusetts' own biomedical companies' research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Why is Massachusetts not working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs? It makes no sense to destroy a species -- with no justification.

What is more, many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their epic annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends. Neighboring states are way ahead of Massachusetts. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while our state is moving in the opposite direction.

Who is getting paid for this travesty of common sense? You are the Marine Fisheries; please do the job Massachusetts citizens expect of you.

Thank you.

From: stuartlynn352@everyactioncustom.com on behalf of Stuart Lynn
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:13:33 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	silvamis@everyactioncustom.com on behalf of melissa silva
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 10:12:29 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: pac1pac2@everyactioncustom.com on behalf of Patricia Carpenter
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:12:18 PM

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From: anush1@everyactioncustom.com on behalf of Peter Haroutian
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:11:16 PM

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From: bryterband@everyactioncustom.com on behalf of Ben Ryterband
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:05:37 PM

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From: bullandcarol@everyactioncustom.com on behalf of Carol Shlimon
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:03:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: Jor6@everyactioncustom.com on behalf of Jane O"Rourke
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:03:15 PM

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From: cameryn.mckinnell@everyactioncustom.com on behalf of Cameryn McKinnelm
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 10:01:30 PM

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From:	meauxmo1@everyactioncustom.com on behalf of Sara Molyneaux
To:	Marine Fish (FWE)
Subject:	There is no rationale for continuing the harvest and resultant killing of horseshoe crabs to harvest their rare blood. Medical science has found an inexpensive way to substitute. Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 9:58:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. This is neither necessary or advised and we in Massachusetts are acting like an uninformed and backward part of scientific thought. Animal-free substitutes are readily available and commonly used elsewhere!

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: mjelse@everyactioncustom.com on behalf of Mary Jane Else
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:58:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Horseshoe carbs survived the extinction of the dinosaurs. But they may not survive us. Imagine that.

Horsehoe crab populations have not rfecovered from a human-caused collapsed in the 1980s and 90s. Despite that, you are proposing increasing the allowable catch.

Alternatives are available now for biomedical use. The conservation of this ancient species is important. Please withdraw the proposed increase in the biomedical harvest quota and begin crafting plans to phase out the harvest.

From: Ken451@everyactioncustom.com on behalf of Kenneth Ridley
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:58:17 PM

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From: wildwomanofgod@everyactioncustom.com on behalf of Judy Yaldatel
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:56:24 PM

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From: harrisdj@everyactioncustom.com on behalf of David Harris
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:56:01 PM

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From:	hoagdj@everyactioncustom.com on behalf of Dianne Hoaglin
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 9:50:35 PM

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Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: gailflei1@everyactioncustom.com on behalf of Gail Fleischaker
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:49:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: lkcoffey@everyactioncustom.com on behalf of lisa coffey dunphy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:46:00 PM

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From: Terranova1842@everyactioncustom.com on behalf of Paul Danielian
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:45:24 PM

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From: zygo@everyactioncustom.com on behalf of Brian Herlihy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:43:04 PM

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From: carolardito@everyactioncustom.com on behalf of Carol Amato
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:43:02 PM

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From: j.hohl.kennedy@everyactioncustom.com on behalf of Jonathan Kennedy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:42:05 PM

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From: apage@everyactioncustom.com on behalf of Alison Page
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:41:07 PM

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From: rona@everyactioncustom.com on behalf of RONA Leventhal
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:40:05 PM

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From:	christina_knapp@everyactioncustom.com on behalf of Christina Knapp
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 9:39:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: mauiranch@everyactioncustom.com on behalf of Abbie Ghini
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:39:06 PM

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From: katcat108@everyactioncustom.com on behalf of Kathleen Lewis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:38:22 PM

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From: congerkelly@everyactioncustom.com on behalf of Kelly Conger
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:37:39 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jlivingstone123@everyactioncustom.com on behalf of Judith Livingstone
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:37:10 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: bonniemaller@everyactioncustom.com on behalf of Bonnie Maller
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:31:37 PM

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From: mauerbach@everyactioncustom.com on behalf of Martha Auerbach
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:31:06 PM

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From: jeaninedoll@everyactioncustom.com on behalf of Jean Sim
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:30:40 PM

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From: marydanag@everyactioncustom.com on behalf of Mary Gershanoff
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:28:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: jonathan.r.adams@everyactioncustom.com on behalf of Jonathan Adams
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:28:20 PM

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From: lisahowell100@everyactioncustom.com on behalf of Lisa Howell
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:27:06 PM

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From: laney576@everyactioncustom.com on behalf of Helene Bank
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:26:24 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: heldarc@everyactioncustom.com on behalf of Andrew Held
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:26:14 PM

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From: roz@everyactioncustom.com on behalf of Rosalyn Driscoll
To: Marine Fish (FWE)
Subject: I love horseshoe crabs! Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:22:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Living near the coast, I'm aware of these ancient crustaceans as important members of the coastal ecosystem.

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From: todonnell4391@everyactioncustom.com on behalf of Taylor O"Donnell
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:18:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: kdcarmignani@everyactioncustom.com on behalf of Kamilla Carmignani
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:16:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: resa@everyactioncustom.com on behalf of Resa Blatman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:12:48 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: revlon72@everyactioncustom.com on behalf of Michelle Collar
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:10:45 PM

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From: jebmays@everyactioncustom.com on behalf of Jeb Mays
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:09:13 PM

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From: apjnlmhz@everyactioncustom.com on behalf of David Mickelsen
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:08:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: wilpf88@everyactioncustom.com on behalf of Laurie Gates
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:08:11 PM

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From: solidfurniture@everyactioncustom.com on behalf of Thomas Dorsey
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:05:09 PM

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From: lesboucher9@everyactioncustom.com on behalf of Leslie Boucher
To: Marine Fish (FWE)
Subject: Please! Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:03:26 PM

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From: abodkhe@everyactioncustom.com on behalf of Ann Bodkhe
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 9:03:08 PM

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From: emb661@everyactioncustom.com on behalf of Judith Embry
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:57:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	mmceachern@everyactioncustom.com on behalf of Maria McEachern
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 8:56:57 PM

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From: cbettington@everyactioncustom.com on behalf of Claire Bettington
To: Marine Fish (FWE)
Subject: PLEASE! Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:56:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Thank you very much
Sincerely,

From: veecougar@everyactioncustom.com on behalf of Lisa Goldwyn
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:51:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: mlkofler@everyactioncustom.com on behalf of Michelle Kofler
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:49:10 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: elainebazarian@everyactioncustom.com on behalf of Elaine Bazarian
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:48:04 PM

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From: jmsbrg377@everyactioncustom.com on behalf of James Burge
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:48:01 PM

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From: leslie.r.pope@everyactioncustom.com on behalf of Leslie Pope
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:46:33 PM

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From: ubklene@everyactioncustom.com on behalf of Lenny Cavallaro
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:45:55 PM

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From: netstuff13@everyactioncustom.com on behalf of D. Chalfin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:45:55 PM

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From: leopardla8y@everyactioncustom.com on behalf of Lisa Kunsch
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:45:54 PM

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From: gden20@everyactioncustom.com on behalf of grace diemand
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:43:12 PM

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From: dennisdiemand17@everyactioncustom.com on behalf of dennis Diemand
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:42:53 PM

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From: ginambennett@everyactioncustom.com on behalf of Gina Bennett
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:42:41 PM

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From: linross7@everyactioncustom.com on behalf of Linda Ross
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:41:11 PM

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From: kaitmadhatter@everyactioncustom.com on behalf of Kate Hermann-Wu
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:40:53 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: vck70@everyactioncustom.com on behalf of Valerie Kerzner
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:36:00 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: njgram6@everyactioncustom.com on behalf of Ruth Boroshok
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:35:47 PM

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From: terryweiner@everyactioncustom.com on behalf of Teresa Weiner
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:35:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Dear Decision-Makers at the MA Division of Fisheries,

Please stop using our horseshoe crabs for experimental research.

I am appalled that in this era or decreasing biodiversity this practice continues.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Sincerely and Urgently,
Teresa R. Weiner
Longmeadow,MA 01106
619-342-5524

From: victoriawalton@everyactioncustom.com on behalf of Victoria Walton
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:35:23 PM

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From: nancypolan@everyactioncustom.com on behalf of Nancy Polan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:34:46 PM

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From: joncosco@everyactioncustom.com on behalf of Jon Cosco
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:34:15 PM

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From: ceacy.henderson@everyactioncustom.com on behalf of Ceacy Henderson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:31:35 PM

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From: tora.tsubasa@everyactioncustom.com on behalf of Chelsea Goodman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:28:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: catwomen5@everyactioncustom.com on behalf of Doreen Gallien
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:28:24 PM

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From: davidlufkin@everyactioncustom.com on behalf of David Lufkin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:26:27 PM

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From: j_w_clapp@everyactioncustom.com on behalf of Jonathan Clapp
To: Marine Fish (FWE)
Subject: Please withdraw the proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:26:23 PM

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From: ksimpson@everyactioncustom.com on behalf of kenneth simpson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:23:30 PM

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From: cat.kroeger.47@everyactioncustom.com on behalf of Catherine Kroeger
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:22:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	taatkins@everyactioncustom.com on behalf of Todd Atkins
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 8:21:50 PM

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From: lens.fines-0m@everyactioncustom.com on behalf of NICOLE MCCRYSTAL
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:21:46 PM

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From: jpmcmahon@everyactioncustom.com on behalf of Julia McMahon
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:20:53 PM

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From: ronald_huntley46@everyactioncustom.com on behalf of Ronald huntley
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:20:46 PM

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From: csnail@everyactioncustom.com on behalf of Clare N McCanna
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:20:19 PM

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From: Millie@everyactioncustom.com on behalf of Millicent Rothman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:19:47 PM

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From: pixiestix4@everyactioncustom.com on behalf of Ailene Robinson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:19:28 PM

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From: mcgrathlbj@everyactioncustom.com on behalf of Laurie W Mcgrath
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:18:00 PM

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From: akluza89@everyactioncustom.com on behalf of Adam Kluza
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:16:52 PM

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From: xrdulgarian@everyactioncustom.com on behalf of Robert Dulgarian
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:15:54 PM

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From: kirstenagweinoldt@everyactioncustom.com on behalf of Douglas Miller
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:13:54 PM

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From:	peter_kahigian@everyactioncustom.com on behalf of Peter Kahigian
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 8:13:22 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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From: salemmeyer@everyactioncustom.com on behalf of Mary Meyer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:13:05 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: janet.greenlee@everyactioncustom.com on behalf of Janet Greenlee
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:12:53 PM

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From: joelflarson@everyactioncustom.com on behalf of Joel Larson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:10:36 PM

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From: jhiggins@everyactioncustom.com on behalf of Janice Higgins
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:10:01 PM

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From: mulberryme@everyactioncustom.com on behalf of Martha Person
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:09:48 PM

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From: dogbun0701@everyactioncustom.com on behalf of Callie Bagdon
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:08:51 PM

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From:	cpans@everyactioncustom.com on behalf of Cynthia Pansing
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 8:08:38 PM

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From: wepfeiffer@everyactioncustom.com on behalf of William Pfeiffer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:08:25 PM

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From: debleecon@everyactioncustom.com on behalf of Constance Graham
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:06:43 PM

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From: pabenj73@everyactioncustom.com on behalf of Patricia Benjamin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:03:42 PM

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From: margaretbj@everyactioncustom.com on behalf of Margaret Bullitt-Jonas
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:01:42 PM

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From: v.huber@everyactioncustom.com on behalf of Victoria Huber
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:01:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Horseshoe crabs are amazing. Think how long they have been around. They play an important role in the ecosystem-migrating birds rely on them for food. Scientific research does not need to rely on their blood anymore. So, please, protect them from unnecessary over harvesting.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: dugasedna@everyactioncustom.com on behalf of Edna Dugas
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:00:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: cmushkin@everyactioncustom.com on behalf of Casey Cochran
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 8:00:39 PM

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From: heinzremold@everyactioncustom.com on behalf of Heinz Remold
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:59:40 PM

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From: goodrichbetsy11@everyactioncustom.com on behalf of Elizabeth Goodrich
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:59:35 PM

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Please protect horseshoe crabs so that our children, and their grandchildren can experience the wonder of seeing these unique creatures!

From: judyw976@everyactioncustom.com on behalf of Judy Walker
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:59:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: Joanep14a@everyactioncustom.com on behalf of Joan Pinkul
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:59:06 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: sashasimone@everyactioncustom.com on behalf of Sasha Simone
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:58:52 PM

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From: ediefr@everyactioncustom.com on behalf of Edith Freedman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:57:00 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: karenrn158@everyactioncustom.com on behalf of Karen Oliverio
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:56:56 PM

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From:	jc.tedford@everyactioncustom.com on behalf of Joel Tedford
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:56:16 PM

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From: jswart26@everyactioncustom.com on behalf of Jon Swart
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:55:36 PM

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From: judithroberts@everyactioncustom.com on behalf of Judith A Roberts
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:55:21 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: laurabessette@everyactioncustom.com on behalf of laura bessette
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:53:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From:	jwfossa@everyactioncustom.com on behalf of Wendy Fossa
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:52:39 PM

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From: jim_strickland@everyactioncustom.com on behalf of jjim strickland
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:51:25 PM

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From: galestuarthunt@everyactioncustom.com on behalf of Gale Hunt
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:50:26 PM

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From: annesmazar@everyactioncustom.com on behalf of Anne Mazar
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:49:03 PM

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From: carefulhands@everyactioncustom.com on behalf of Paula Myles
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:48:43 PM

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From: lepagelucille2@everyactioncustom.com on behalf of Lucille LePage
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:46:42 PM

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From: smusella@everyactioncustom.com on behalf of sandra musella
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:46:31 PM

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From:	hotjenday@everyactioncustom.com on behalf of Tammy King
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:46:19 PM

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From:	tufanisengupta@everyactioncustom.com on behalf of Tufani SenGupta
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:46:18 PM

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From: boudsa@everyactioncustom.com on behalf of Susan Boudreau
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:45:32 PM

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From:	tmpratt99@everyactioncustom.com on behalf of Theresa Pratt
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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: frenchfam5@everyactioncustom.com on behalf of Priscilla French
To: Marine Fish (FWE)
Subject: Please ban biomedical harvesting of the vulnerable horseshoe crab, a survivor of millions of years.
Date: Monday, March 2, 2026 7:42:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

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From: chavez.michelyne@everyactioncustom.com on behalf of Michelyne Chavez
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:42:26 PM

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From: orch52jr@everyactioncustom.com on behalf of Joyce Rowley
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:42:25 PM

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From: kermittf8@everyactioncustom.com on behalf of Trina Novak
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:41:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	wendybeck1@everyactioncustom.com on behalf of Wendy Beck
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:41:51 PM

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From: carwalker58@everyactioncustom.com on behalf of Carol Walker
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:40:25 PM

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From: derogers_98@everyactioncustom.com on behalf of Dennis Rogers
To: Marine Fish (FWE)
Subject: Please withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:38:24 PM

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From: jdmedd50@everyactioncustom.com on behalf of Joseph Martinez
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:37:52 PM

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From: ds4paws@everyactioncustom.com on behalf of Diane Saunders
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:37:50 PM

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From: nekoni_6@everyactioncustom.com on behalf of Elizabeth Olson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:35:24 PM

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From: briangin54@everyactioncustom.com on behalf of Brian Gingras
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:35:17 PM

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From: dazrel@everyactioncustom.com on behalf of Donald Stamplfer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:35:13 PM

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From: gaffeymatthew@everyactioncustom.com on behalf of Matthew Gaffey
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:34:49 PM

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The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: carolinekipling@everyactioncustom.com on behalf of Caroline Kipling
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:34:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: abrahambarbara326@everyactioncustom.com on behalf of Barbara Abraham
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:34:21 PM

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From: bryant.colleen08@everyactioncustom.com on behalf of Colleen Bryant
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:32:12 PM

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From: kristincoop@everyactioncustom.com on behalf of Kristin Cooper
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:31:34 PM

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From: manikans277@everyactioncustom.com on behalf of Walker Wright
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:31:22 PM

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From:	kath7766@everyactioncustom.com on behalf of Kathy Young
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:31:04 PM

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From: bj@everyactioncustom.com on behalf of B.J. Herbison
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:30:49 PM

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From: Kamots73105@everyactioncustom.com on behalf of Ann Marie Ross
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:29:52 PM

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From: doylemaureen3@everyactioncustom.com on behalf of Maureen doyle
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:28:16 PM

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s ecosystem. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From:	stevensbrady@everyactioncustom.com on behalf of Brooks Stevens
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:27:53 PM

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From: c.cooney@everyactioncustom.com on behalf of Christine Cooney
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:27:17 PM

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From: hooppole@everyactioncustom.com on behalf of Jodi Rodar
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:26:33 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

Thank you for your time regarding this critical issue.

From: megan@everyactioncustom.com on behalf of Megan Lepore
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:25:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: ejefield16@everyactioncustom.com on behalf of Liz Field
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:24:30 PM

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From: janepellis@everyactioncustom.com on behalf of Jane Ellis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:22:13 PM

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DO THE RIGHT THING. OUR NEIGHBORING STATES HAVE.

From: vashabru@everyactioncustom.com on behalf of Roberta Brunelle
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:21:30 PM

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From: dspencer21661@everyactioncustom.com on behalf of Deborah Spencer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:20:34 PM

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From: klelane@everyactioncustom.com on behalf of katie L
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:19:06 PM

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From: scoochie9@everyactioncustom.com on behalf of Emily Macdonald
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:18:22 PM

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From: njonathan169@everyactioncustom.com on behalf of Nancy Rochelau
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:18:20 PM

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From: nsfriedman@everyactioncustom.com on behalf of Nina Friedman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:15:41 PM

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From: dwcash@everyactioncustom.com on behalf of David Cash
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:15:21 PM

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From: jajm4@everyactioncustom.com on behalf of Jodi Ross
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:14:29 PM

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From: catladyfr@everyactioncustom.com on behalf of Linda Jones
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:14:26 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: donnabmccolgan@everyactioncustom.com on behalf of Donna Blythe-McColgan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:13:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: stefanski_kttn@everyactioncustom.com on behalf of Karen Stefanski
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:12:23 PM

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From: smagdanz1@everyactioncustom.com on behalf of Susan magdanz
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:12:17 PM

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From: Db_Louie@everyactioncustom.com on behalf of Bill Lui
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:11:18 PM

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From:	holidayh@everyactioncustom.com on behalf of Holiday Houck
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:11:13 PM

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From:	gaelen@everyactioncustom.com on behalf of Gaelen Yannetti
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:11:07 PM

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From: tfhavel@everyactioncustom.com on behalf of Timothy Havel
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:09:31 PM

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From: beth.rosenberg@everyactioncustom.com on behalf of Beth Rosenberg
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:09:29 PM

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From: drdebrooks@everyactioncustom.com on behalf of Daniel Brooks
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:09:15 PM

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From: nhhiker_5@everyactioncustom.com on behalf of Deborah Anderson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:09:03 PM

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From: coreylittle2000@everyactioncustom.com on behalf of Corey Little
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:06:46 PM

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From:	dplldc4@everyactioncustom.com on behalf of Donna Parente
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:06:24 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: lindajorel@everyactioncustom.com on behalf of Linda Orel
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:06:03 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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From: quichelorraine@everyactioncustom.com on behalf of Lorraine Miller
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:05:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Let's take steps to protect the marine life on and off our shores! Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether. Let's do the right thing in MA!

From: tammyluppino@everyactioncustom.com on behalf of Tammy Luppino
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:04:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: simchaboston@everyactioncustom.com on behalf of Ailsa Hermann-Wu
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:04:38 PM

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From: sarahbstewart@everyactioncustom.com on behalf of Sarah Stewart
To: Marine Fish (FWE)
Subject: Please withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:02:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	elisengbzoli@everyactioncustom.com on behalf of Elise Zoli
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:02:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation, scientific and innovation leadership, with innovation and education underpinning its prosperity (See, e.g., the Hamilton Project's The Geography of Prosperity, Brookings). I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

Please note that this longer and more detailed version should be the one included in the record. I accidentally hit send before I was completed.

Lastly, please be advised that I am a Massachusetts resident, resident on the coastline, and can attest to the loss of these animals and their importance to migratory birds. I am also a partner at WSGR. I will support any and all environmental organizations and residents on a pro bono basis to challenge this unreasonable, unscientific activity before the courts.

Thank you.

From:	vieira.carla.c@everyactioncustom.com on behalf of Carla Vieira
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 7:02:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: ellparsons@everyactioncustom.com on behalf of Ellen Parsons
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:02:13 PM

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Thank you
Ellen Parsons

From: elanakatz@everyactioncustom.com on behalf of Elana Katz Rose
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:01:55 PM

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From: mayanorton2014@everyactioncustom.com on behalf of Maya Norton
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:01:29 PM

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From: edmeesh@everyactioncustom.com on behalf of Michelle Sleeper
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 7:00:00 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: beybomb@everyactioncustom.com on behalf of Nancy Swartwout
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:58:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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From: aulibatts@everyactioncustom.com on behalf of Auli Batts
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:57:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: ms.annie@everyactioncustom.com on behalf of Ann Boudreau
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:57:44 PM

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From: flynch@everyactioncustom.com on behalf of Frances Lynch
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:57:30 PM

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From: mrosed313@everyactioncustom.com on behalf of Maggie D
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:57:17 PM

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From: marsumac@everyactioncustom.com on behalf of Susan Mackle
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:54:28 PM

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From: loribradley@everyactioncustom.com on behalf of Lori Bradley
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:54:27 PM

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From: martharwales@everyactioncustom.com on behalf of Martha Wales
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:53:37 PM

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From: hcseailles@everyactioncustom.com on behalf of Heloise C. Seailles
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:52:52 PM

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From: MidnightBlue_22@everyactioncustom.com on behalf of Francine Traniello
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:51:51 PM

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From:	alan@everyactioncustom.com on behalf of Alan Papscun
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:51:51 PM

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From: haynes.pb@everyactioncustom.com on behalf of Polly Haynes
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:51:19 PM

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From: ahooper4@everyactioncustom.com on behalf of Anne Hooper Webb
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:51:18 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: elisengbzoli@everyactioncustom.com on behalf of Elise Zoli
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:51:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: ginnadonovan@everyactioncustom.com on behalf of Ginna Donovan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:50:20 PM

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From: bancum@everyactioncustom.com on behalf of Mihail Bancu
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:48:48 PM

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Dear Massachusetts Division of Marine Fisheries,

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From: jbowdan@everyactioncustom.com on behalf of Janet Bowdan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:47:48 PM

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Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. They are gentle & have played a major role in helping humans; we have an obligation to protect them.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From:	busterseyes@everyactioncustom.com on behalf of Nancy Nolan
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:47:41 PM

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From: shelleyn@everyactioncustom.com on behalf of Shelley Monaghan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:47:39 PM

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From: sherrionkauai@everyactioncustom.com on behalf of Sherri Paul
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:47:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: harriet9203@everyactioncustom.com on behalf of Harriet Hutchinson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:47:17 PM

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From:	FaDWUTS@everyactioncustom.com on behalf of Sagar Patel
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:46:27 PM

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From: cas_casanova@everyactioncustom.com on behalf of Justin Casanova
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:45:35 PM

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From: kali1111@everyactioncustom.com on behalf of Pam Youngquist
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:45:15 PM

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From: jmshammas@everyactioncustom.com on behalf of JM Shammas
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:44:52 PM

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From: kathymireault2012@everyactioncustom.com on behalf of Kathleen Mireault
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:44:17 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: honeydrinker@everyactioncustom.com on behalf of Amy Christenson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:44:17 PM

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From: vvm1212@everyactioncustom.com on behalf of Holly Gomes
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:43:53 PM

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From: allison.matteodo@everyactioncustom.com on behalf of Allison Matteodo
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:43:41 PM

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From: skinskedaddle@everyactioncustom.com on behalf of Diane Biase
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:43:13 PM

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From: lindal600@everyactioncustom.com on behalf of linda cioffi
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:42:50 PM

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From: Kev1120@everyactioncustom.com on behalf of Kevin Laliberte
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:42:35 PM

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From: safetyisabasicneed@everyactioncustom.com on behalf of Alexandra Gardiner
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:42:17 PM

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From: bostonredsoxrule@everyactioncustom.com on behalf of Lynn Small
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:41:25 PM

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From: cjbritt@everyactioncustom.com on behalf of Carolyn Britt
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:39:50 PM

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From: tomedwol@everyactioncustom.com on behalf of Thomas Wolslegel
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:39:12 PM

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From: kfitz491@everyactioncustom.com on behalf of Kelsey Fitzgerald
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:39:11 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: siberian666@everyactioncustom.com on behalf of William Dearstyne
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:38:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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From: jlchatham1@everyactioncustom.com on behalf of Chatham Janet
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:38:49 PM

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From: melissajgrondin@everyactioncustom.com on behalf of Melissa Grondin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:37:27 PM

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Dear Massachusetts Division of Marine Fisheries,

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From: mcole71@everyactioncustom.com on behalf of M C
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:37:12 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: suburban_seaqueen@everyactioncustom.com on behalf of Alexandra Stella D"maris
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:36:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: lnahan@everyactioncustom.com on behalf of Lena N
To: Marine Fish (FWE)
Subject: Please do NOT increase in the horseshoe crab biomedical harvest quota.
Date: Monday, March 2, 2026 6:36:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

As someone who loves our coastal ecosystems and the amazing animals who call it home, I strongly urge you to withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: h216scrf@everyactioncustom.com on behalf of Heather Fox
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:36:08 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: angelabernadette@everyactioncustom.com on behalf of Angela D"Souza
To: Marine Fish (FWE)
Subject: Horseshoe crabs are an important species in the biodiversity and survival of our ecosystem
Date: Monday, March 2, 2026 6:35:57 PM

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Dear Massachusetts Division of Marine Fisheries,

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With concern,
Angela D'Souza

From: lauracanter@everyactioncustom.com on behalf of Laura Canter
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:35:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs. this issue is important to me because of the time that I spend observing horseshoe crabs, and also the work that my son does as a naturalist tracking shore birds. He is a 2025 graduate of College of the Atlantic in Bar Harbor, ME.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: flucies@everyactioncustom.com on behalf of Frederick Lucies
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:35:35 PM

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From: tjaneb@everyactioncustom.com on behalf of Tracy J Brown
To: Marine Fish (FWE)
Subject: Do not increase the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:35:10 PM

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From: gmpwilson@everyactioncustom.com on behalf of Gloria Willson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:34:58 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jshop211@everyactioncustom.com on behalf of Jane Luu
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:34:56 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

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From: jennag11@everyactioncustom.com on behalf of Jenna Garvey
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:34:54 PM

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From: kfmc64@everyactioncustom.com on behalf of Kathleen McHendry
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:33:35 PM

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From: KathyClark903@everyactioncustom.com on behalf of Kathy Clark
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:33:03 PM

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From: m3w1223@everyactioncustom.com on behalf of Michael Wilson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:32:13 PM

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From: celine_devlin@everyactioncustom.com on behalf of celine devlin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:31:40 PM

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From: josephmarkdavis@everyactioncustom.com on behalf of Joseph Davis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:31:34 PM

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From: hummann@everyactioncustom.com on behalf of Mary Mann
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:30:06 PM

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From: mauraacoughlin@everyactioncustom.com on behalf of Maura Coughlin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:29:52 PM

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From: Louie617@everyactioncustom.com on behalf of LOUIS DRINKWATER
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:29:50 PM

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From: blackdiamondsband@everyactioncustom.com on behalf of Wolfgang burger
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:29:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: anetvet@everyactioncustom.com on behalf of Annette Murphy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:28:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

Transition to no animal testing.

No commercial harvesting of horse crabs.

Keep up with the states surrounding MA.

Please! This is urgent.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to

synthetic alternatives by implementing plans to phase out the catch altogether.

From: ruhosmith@everyactioncustom.com on behalf of Ruth Smith
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:28:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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From: newview05@everyactioncustom.com on behalf of Nancy Burbeck
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:28:21 PM

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From: dlkolakoski@everyactioncustom.com on behalf of Diane L. Kolakoski
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:28:18 PM

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From: bmardigras@everyactioncustom.com on behalf of nancy burger
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:28:10 PM

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From: Deewitched@everyactioncustom.com on behalf of Deedee Bedford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:27:05 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	mwexler43@everyactioncustom.com on behalf of Marjorie Wexler
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:27:04 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The industry is shifting toward synthetic alternatives for blood testing, such as recombinant factor C. That's what Massachusetts, with its excellent biomedical research facilities, should be doing.

PLEASE!!

From:	marineart@everyactioncustom.com on behalf of Elizabeth Perry
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:26:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Hello,

In 2020-21 I designed and installed a Horseshoe Crab garden in Boston in front of an internationally known museum: the Museum of Fine Arts. Rimmed in shell, and mounded up it was covered in sedges, corn and beans highlighting Native presence, culture and Bostons identity as an important coastal city that depends on the resources of a healthy ocean.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s.

Massachusetts' rent-a-crab program is still not sustainable. And the bled horseshoe crabs have a very high mortality rate. Shorebirds, fish and other species depend upon horseshoe crabs in the western Atlantic.
This proposal places Massachusetts even further behind neighboring states.

Please withdraw proposed increases in the biomed harvest quota. Please do accelerate the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: irenetilton26@everyactioncustom.com on behalf of Irene Tilton
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:26:34 PM

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From: julie.bernstein@everyactioncustom.com on behalf of Julie Bernstein
To: Marine Fish (FWE)
Subject: Please withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:26:33 PM

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Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

There is no need to be killing Horseshoe crabs when excellent recombinant proteins can replace horseshoe blood in medical testing (see https://urldefense.com/v3/__https://www.mbl.edu/news/us-pharmacopeia-oks-synthetic-alternatives-horseshoe-crab-blood__;!!CPANwP4y!VT-hmoKlGufJNTwo4gRrV5Nv5BjlztO9RAyatXYfDxqzeW-2hJIXWH7OtoFd-ro270u-V8CidA2Z3X2gFi2_exrsBiwuAYMr27HtUg$). 15-30% of horseshoes die after they are bled and released and with their numbers plunging it is unethical for us to continue to bleed them.

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Thank you for taking our responsibility to protect creatures on our planet from extinction seriously.

Julie Bernstein

From: nottmary@everyactioncustom.com on behalf of Mary Nott
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:26:01 PM

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From: cheetahsprinter@everyactioncustom.com on behalf of Sofia Montemayor-Thomas
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:24:53 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	nizkole@everyactioncustom.com on behalf of Nicole Day
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:24:06 PM

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From: diesel08@everyactioncustom.com on behalf of Jay Stearns
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:24:02 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	sredlich2010@everyactioncustom.com on behalf of Susan Redlich
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:23:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

I have walked the beaches on the Cape during the horseshoe crab mating season and have noticed fewer each year. The biosphere needs a healthy population of crabs to support coastal bird populations. Do not trade off one species when there is potential for animal-free alternatives.

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: helenloz@everyactioncustom.com on behalf of Helen Lozoraitis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:23:51 PM

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From: lareyneleveult@everyactioncustom.com on behalf of Lisa G
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:23:05 PM

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From: fluteboyd@everyactioncustom.com on behalf of Kathleen Boyd
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:22:10 PM

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From: tyaskell@everyactioncustom.com on behalf of Tina Yaskell
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:22:01 PM

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From: emilytnelson@everyactioncustom.com on behalf of Emily Nelson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:20:59 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Why increase horseshoe crab quotas when other options exist? Why?

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From:	ssymcdonald@everyactioncustom.com on behalf of Sharon Mcdonald
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:20:57 PM

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From: meowroy@everyactioncustom.com on behalf of Stephanie Roy
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:20:50 PM

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From: kat.dander@everyactioncustom.com on behalf of katherine dander
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:20:45 PM

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From: kathy.sniezek@everyactioncustom.com on behalf of Kathy Sniezek
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:20:45 PM

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From: kittyhawk12348@everyactioncustom.com on behalf of Deirdre Morris
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:19:18 PM

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From: cfritz22@everyactioncustom.com on behalf of Christy Fritz
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:19:17 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: klabbj@everyactioncustom.com on behalf of Katherine Levin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:18:59 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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From: rwmaxfield@everyactioncustom.com on behalf of Roger Maxfield
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:18:27 PM

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From: peepsl@everyactioncustom.com on behalf of Paula Barrett
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:18:24 PM

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From: rreichmann76@everyactioncustom.com on behalf of Richard Reichmann
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:18:05 PM

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From: DFL1982@everyactioncustom.com on behalf of Dan Lamb
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
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From: crokie12@everyactioncustom.com on behalf of Carol Meade
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:17:36 PM

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From: rosannemazarian@everyactioncustom.com on behalf of Rosanne Azarian
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:17:02 PM

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From: martinkathryne900@everyactioncustom.com on behalf of Kathryne Martin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:16:24 PM

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From: ejrutman@everyactioncustom.com on behalf of Eric Rutman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:16:20 PM

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From:	jolmez@everyactioncustom.com on behalf of Justine Olmez
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:16:16 PM

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From: cory.alperstein@everyactioncustom.com on behalf of Cory Alperstein
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:16:15 PM

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From: s.sobek@everyactioncustom.com on behalf of Sandra Sobek
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:16:12 PM

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: a-hartdegen@everyactioncustom.com on behalf of AB Hartdegen
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:16:06 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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From: abu.altman@everyactioncustom.com on behalf of Allen Altman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:15:17 PM

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From:	north4art@everyactioncustom.com on behalf of Jeanne Anderson
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:15:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

I heard someone speak on this subject on the news. This seems to be an area of biomedical testing that has been overlooked and unregulated.

Every species counts.

We do not allow the kind of testing that results in death for other animals. This is inhumane. Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

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From: wzzw19@everyactioncustom.com on behalf of Mary Thomas
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:14:42 PM

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Dear Massachusetts Division of Marine Fisheries,

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From: chrisg2365@everyactioncustom.com on behalf of Christine Guerrero
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:14:38 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: martinkathryne900@everyactioncustom.com on behalf of Kathryne Martin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:14:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: steveragon1@everyactioncustom.com on behalf of Stephen Ragon
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:14:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: lillian.olmsted@everyactioncustom.com on behalf of Lillian Olmsted
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:14:08 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

This is again allowing the big Pharma to profit off of our vulnerable horseshoe crabs. They have shown they do not care who suffered from their greed. Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: JJJDVM@everyactioncustom.com on behalf of Jennifer Johnson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:14:01 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From:	peneople777@everyactioncustom.com on behalf of Rosemary Seifert-Graf
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:13:02 PM

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From: andrewcostigan08@everyactioncustom.com on behalf of Andrew Costigan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:12:30 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: rbodeman1@everyactioncustom.com on behalf of Ruth Bodeman
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:12:07 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: csgilmore@everyactioncustom.com on behalf of Cathi Gilmore
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:12:06 PM

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Already biomedical harvests of horseshoe crabs have more than doubled in the past six years to more than 1 million crabs annually, according to the Atlantic States Marine Fisheries Commission.

Independent studies show that 30% of the crabs, or more, die as a result of the bleeding process or suffer significant sublethal effects that impair their ability to spawn.

And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: jcdubis@everyactioncustom.com on behalf of Joan Dubis
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:11:49 PM

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From: lynnb@everyactioncustom.com on behalf of Lynn Bengston
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:10:51 PM

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From: lsbruno@everyactioncustom.com on behalf of Deb Bruno
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:10:49 PM

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From:	leanybean@everyactioncustom.com on behalf of Arlene Johnson
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:10:27 PM

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Sincerely,

Arlene Johnson
Publisher/Author
https://urldefense.com/v3/__http://www.truedemocracy.net__;!!CPANwP4y!QlSjlKt6VPW2nHLSKtNk8rnyLiZbkAPB5Ky4jDgp4-RSU9eVBFC6z5JXngBgsxWnOV7yv7IpmyeCJTyLuGK5iz40HbWgrA$
To access my work, which is top secret history, click on the icon that says Magazine. It's free and internationally acclaimed.

From: lovell317@everyactioncustom.com on behalf of Sonya Brock
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:10:27 PM

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From: wenquest@everyactioncustom.com on behalf of Wendi Quest
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:10:25 PM

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From: jeannebhanson@everyactioncustom.com on behalf of Jeanne Hanson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:09:45 PM

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From: spell938@everyactioncustom.com on behalf of Shirley Pelletier
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:09:18 PM

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From: rayshows@everyactioncustom.com on behalf of Ray Sawyer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:09:05 PM

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From: lynnraejackson@everyactioncustom.com on behalf of Lynn Jackson
To: Marine Fish (FWE)
Subject: Please Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:08:42 PM

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From:	pamelamax1@everyactioncustom.com on behalf of Pamela Maxfield
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:08:14 PM

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From: bkmazar@everyactioncustom.com on behalf of Brian Mazar
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:07:46 PM

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This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

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Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From: bjnelson62_nojunk@everyactioncustom.com on behalf of Brian Nelson
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:07:33 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: gidragon@everyactioncustom.com on behalf of Matthew Falconer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:07:25 PM

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From: rayshows@everyactioncustom.com on behalf of Raymond T Sawyer
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:07:07 PM

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From: kcomboston@everyactioncustom.com on behalf of Jane Kuby
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:06:34 PM

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From: lara@everyactioncustom.com on behalf of Lara Sullivan
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:06:33 PM

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From: ecmiller67@everyactioncustom.com on behalf of Erin Miller
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:06:28 PM

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From: rashore1@everyactioncustom.com on behalf of Robert Shore
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:06:13 PM

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From: elprefon@everyactioncustom.com on behalf of Eileen Prefontaine
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:06:02 PM

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From: lissafer117@everyactioncustom.com on behalf of Elizabeth Gifford
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:05:57 PM

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From:	ghusted@everyactioncustom.com on behalf of Gillian Husted
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:05:24 PM

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From: cheryl.alison22@everyactioncustom.com on behalf of Cheryl Alison
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:05:16 PM

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From: tanmarie78@everyactioncustom.com on behalf of Tania Cardoso
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:05:15 PM

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And Massachusetts' rent-a-crab program — which routes bait-designated crabs to biomedical bleeding labs first — creates a loophole that obscures the true scale of the catch. According to local experts, rent-a-crab adds an additional 100,000 crabs to the blood-harvest total, a staggering number that undermines conservation goals.

Massachusetts is home to biomedical companies whose own research shows we no longer need horseshoe crab blood to ensure patient safety. Bleeding companies are marketing the animal-derived agent side-by-side with newer animal-free alternatives. These synthetic tests are FDA- and USP-recognized and are already used in treatments for diabetes, obesity, COVID-19, and many other medicines and vaccines. Massachusetts should be working to accelerate the transition to synthetics rather than increasing the use of horseshoe crabs.

This proposal places Massachusetts even further behind neighboring states. In the past three years, Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, while Massachusetts is moving in the opposite direction. Increasing Massachusetts' biomedical quota by more than 80,000 crabs is a rejection of modern science and regional conservation trends.

Many imperiled shorebirds — including federally threatened red knots — depend on horseshoe crabs to survive. Red knots time their annual migration to coincide with horseshoe crab spawning, feeding on horseshoe crab eggs in Massachusetts to fuel their 19,000-mile journey from South America to the Arctic. As horseshoe crab populations have plummeted, so have red knot numbers.

Massachusetts prides itself on conservation and scientific leadership. I urge the division to prioritize conservation by withdrawing the proposed increase in the biomedical harvest quota and instead accelerating the transition to synthetic alternatives by implementing plans to phase out the catch altogether.

From:	thompson_don@everyactioncustom.com on behalf of Don Thompson
To:	Marine Fish (FWE)
Subject:	Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date:	Monday, March 2, 2026 6:04:54 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

Please withdraw the proposed increase in the biomedical catch quota in Massachusetts for horseshoe crabs.

The American horseshoe crab has survived 450 million years and multiple mass extinctions, but it has failed to recover from a catastrophic population collapse caused by overharvest in the 1980s and 1990s. Populations remain seriously depleted in Massachusetts. Increasing the catch will impede the recovery of horseshoe crabs in the Commonwealth and further threaten the species' survival.

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From: jennygolay@everyactioncustom.com on behalf of Jenny Golay
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:04:51 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: martinkathryne900@everyactioncustom.com on behalf of Kathryne Martin
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:04:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Massachusetts Division of Marine Fisheries,

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From: mctunes88@everyactioncustom.com on behalf of Mike McKenna
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:04:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: siobhandmcg@everyactioncustom.com on behalf of Siobhan McGurk
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:03:59 PM

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From: krierba@everyactioncustom.com on behalf of Betty Krier
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:03:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

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From: annberndt@everyactioncustom.com on behalf of Ann Berndt
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:03:44 PM

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From: m.ridgeobrien@everyactioncustom.com on behalf of Mariah Ridge-O"Brien
To: Marine Fish (FWE)
Subject: Withdraw proposed increases in the horseshoe crab biomedical harvest quota
Date: Monday, March 2, 2026 6:03:31 PM

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From: Emily Weisgrau
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, March 6, 2026 3:53:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Emily Weisgrau
Truro, MA

From: J. David Jacobs
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Wednesday, March 4, 2026 4:59:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Brewster Massachusetts resident regarding the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Regarding horseshoe crabs, there is a declining demand for bait and an increasing demand for biomedical purposes. These crabs have not fully recovered statewide. **We should end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Thank you for considering my comments.

J. David Jacobs
tinyurl.com/jdjsculptures
tinyurl.com/jdjfilms

From: lisajholt
To: Marine Fish (FWE)
Subject: Att: Dan McKiernan, Director Mass Division of Marine Fisheries
Date: Wednesday, March 4, 2026 4:30:07 PM

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Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Lisa Holt
Chatham, MA

From:	Brett Warren
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Tuesday, March 3, 2026 4:28:43 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

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Thank you for considering my comments.

Sincerely,
Nancy Warren
Yarmouth MA

From: Mark Barry
To: Marine Fish (FWE)
Cc: sharl@horseshoecrabs.org
Subject: Horseshoe crabs public comment
Date: Tuesday, March 3, 2026 12:14:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

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Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

I am a lifelong beach goer and have noticed over the years, the steady decline of horseshoe crabs in Wareham and Onset. It both saddens and alarms me. They are extremely necessary to our ecosystem and deserve to live their normal life in the ocean and not in a laboratory or bait trap.

Thank you for considering my comments.

Sincerely,
Amy Tamagini
Wareham, MA

From: Michael Dunn
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Monday, March 2, 2026 2:33:17 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

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Thank you for considering my comments.

Michael Dunn
Scituate, MA

From: Michael D
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Monday, March 2, 2026 2:31:48 PM

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Thank you for considering my comments.

Michael Dunn
Scituate, MA

From: Mass Audubon on behalf of Emily Isaac
To: Marine Fish (FWE)
Subject: Please approve DMF"s horseshoe crab proposal
Date: Monday, March 2, 2026 1:46:04 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Mar 2, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Emily Isaac
62 Bay State Ave
Somerville, MA 02144
(301) 956-9000
emily.isaac123@gmail.com

From: Jean Hills
To: Marine Fish (FWE)
Subject: ATTN: Director McKiernan Horseshoe Crab Bait Proposal
Date: Monday, March 2, 2026 1:00:43 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Director McKiernan,

When I was a child on Cape Cod, one of my favorite pass times was to watch the horseshoe crabs along our beaches, and to follow their trails on the sand bars at low tide. It sparked an interest in marine biology which I still follow. But the opportunity to watch these marine creatures is all but gone.

Horseshoe crabs have been in peril for quite some time. Under pressure from fishermen, looking for cheap bait; and private industry, looking to drain their blood. These animals have a significant place in the ecosystem and food chain, their eggs serve as an important source of nutrition for shore birds.

Now, it has come to my attention that the Mass Division of Marine Fisheries is considering a proposal that would limit the use of horseshoe crabs as bait.
However, the same proposal will expand the blood-letting of these creatures.

The blood letting process is NOT a harmless procedure. Not all of those horseshoe crabs survive. This is a creature that has managed to survive millions of years in the ocean. Now, we are allowing it to fall prey to an industry that has an available synthetic replacement for their blood, namely Recombinant Factor C. This synthetic is used by major pharmaceutical companies in the US, Europe and Asia.

Why can't we follow what New York has done? and protect this species?

PLEASE do the right thing by these creatures and other species that depend on them.

Thank you.

Jean Hills
Pocasset, MA

From:	Sally
To:	Marine Fish (FWE)
Subject:	Horseshoe crabs need better protection in MA
Date:	Friday, February 27, 2026 5:22:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident from Cape Cod, and I wish to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Essentially, this would:

- **expand biomedical exploitation;**
- **maintain bait quotas that exceed actual need;**
- **put Massachusetts out of step with neighboring states; and**
- **ignore unresolved concerns about population recovery**

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Sally Brotman



Truro, MA 02666

From: BERNADETTE ERICSON
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 27, 2026 12:36:56 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan -

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.**

Horseshoe crabs are a public trust resource with critical ecological value. Management decisions should prioritize conservation, transparency, and long-term population recovery.

Sincerely,
Bernadette Sullivan Ericson
Cataumet, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe Crabs Are a Public Trust Resource, Not a Private Commodity
Date: Friday, February 27, 2026 10:47:52 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Janet Rothrock <jrothrock@hyraxes.com>
Sent: Friday, February 27, 2026 10:38 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>; Marine Fish (FWE) <marine.fish@mass.gov>
Subject: Horseshoe Crabs Are a Public Trust Resource, Not a Private Commodity

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Director Daniel McKiernan,

In 2023, the Massachusetts Division of Marine Fisheries capped the biomedical horseshoe crab quota at 200,000 and split that quota evenly between the two existing processors. Now, DMF is proposing to raise the biomedical quota to 280,000 crabs, plus routing an additional 100,000 bait crabs through the rent-a-crab program. to the bleeding facilities. Why?

Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery and conservation.

Synthetic alternatives to horseshoe crab blood exists, bait demand is declining, and conservation-first management is achievable—if Massachusetts chooses to lead rather than lag behind.

Janet Rothrock
618 Annursnac Hill Road
Concord, MA 01742

From: Janet Rothrock
To: McKiernan, Dan (FWE); Marine Fish (FWE)
Subject: Horseshoe Crabs Are a Public Trust Resource, Not a Private Commodity
Date: Friday, February 27, 2026 10:38:02 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Director Daniel McKiernan,

In 2023, the Massachusetts Division of Marine Fisheries capped the biomedical horseshoe crab quota at 200,000 and split that quota evenly between the two existing processors. Now, DMF is proposing to raise the biomedical quota to 280,000 crabs, plus routing an additional 100,000 bait crabs through the rent-a-crab program. to the bleeding facilities. Why?

Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery and conservation.

Synthetic alternatives to horseshoe crab blood exists, bait demand is declining, and conservation-first management is achievable—if Massachusetts chooses to lead rather than lag behind.

Janet Rothrock
618 Annursnac Hill Road
Concord, MA 01742

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe Crab Proposal
Date: Friday, February 27, 2026 8:59:22 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

-----Original Message-----
From: Donna Petrangelo <nipntuck222@verizon.net>
Sent: Friday, February 27, 2026 8:39 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Horseshoe Crab Proposal

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Please do not go forward with the Division of Marine Fisheries' proposal to increase the number of horseshoe crab that are allowed to be harvested each year so that their blood can be utilized for medical purposes and testing. There is a synthetic alternative available that has been approved by US Pharmacopeia and supported by Congress.

Respectfully,

Donna Petrangelo, 16 Atlantic St., Plymouth, MA 02360 Sent from my iPhone

From:	Veronica Hernandez Brown
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Friday, February 27, 2026 5:12:30 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

--
Veronica H. Brown
South Dennis, MA
www.DrawnFromSeed.com

From: Fran Raleigh
To: Marine Fish (FWE)
Subject: Horseshoe Crab quotas
Date: Thursday, February 26, 2026 8:58:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

We are not the only creatures that matter. Horseshoe crabs are essential resources to the marine ecosystem and to migrating shorebirds. Shorebirds are declining rapidly and they need our protection. Migrating from their South American wintering grounds, the birds may lose half their body weight before stopping at feeding areas where horseshoe crabs are laying eggs on the beaches. The birds probe the sand for eggs to fatten up for the rest of their journey. The crabs and birds have been coexisting in this way for countless generations, but our industrial harvesting of crabs is causing them to decline, and there are not enough eggs being laid for the birds' food and the crab's reproduction.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Fran Raleigh
Eastham, MA

From: Susan E.R. Mitchell
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Thursday, February 26, 2026 3:27:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Susan Mitchell
Plymouth, MA

From: s.genome@proton.me
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Thursday, February 26, 2026 11:31:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Steve Fowler
Teaticket, MA

Sent with Proton Mail secure email.

From: Lydia Rheinhardt
To: Marine Fish (FWE)
Subject: Attention Dan McKiernan!!!
Date: Thursday, February 26, 2026 9:52:26 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am a born and raised Massachusettes residents and am reaching out in regards to the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Lydia Rheinhardt
Cape Cod, MA

From: Penelope Neal
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan / Horseshoe Crab Quotas
Date: Wednesday, February 25, 2026 5:38:59 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Penelope Neal
Gloucester, MA

From: Susan Quateman
To: Marine Fish (FWE)
Subject: DMF proposal to change horseshoe crab quotas - my comments
Date: Wednesday, February 25, 2026 2:37:48 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Gloucester, Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas. I am also a silk painter and Great Marsh Artist, currently co-creating multi-media public performances with Arpeggione Ensemble on the intertwined relationship of horseshoe crabs and red knots, 'Music and Silk: an Ancient Creature and a Shorebird's Survival'.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is the right and proper time to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a keystone species and all management decisions should prioritize conservation, long-term population recovery, and thoughtfulness in ensuring the continuation of this vital species for preserving coastal ecosystems and biodiversity.

Thank you for considering my comments.

Yours sincerely,

Susan Quateman
Gloucester, MA.

From: mwlbr
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Wednesday, February 25, 2026 2:35:10 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Margaret Wilbur
67 Bay Rd
Harwich, MA

From: Edith Copenhaver
To: Marine Fish (FWE)
Subject: Horseshoe Crab protections
Date: Wednesday, February 25, 2026 11:38:08 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts Cape Cod resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Please protect these amazing animals. We have the technology to use a synthesized blood testing product now. We should be weaning off of using the horseshoe crab blood.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Edith Copenhaver
Woods Hole, MA

From: Craig Maser
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Wednesday, February 25, 2026 8:02:17 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' proposal to revise horseshoe crab harvest quotas.

Given that the proposal itself notes declining demand for bait and simultaneously expands the number of horseshoe crabs allocated for biomedical use—at a time when the statewide population has not fully recovered—this is the appropriate moment to end the use of horseshoe crabs for bait and to maintain the existing 200,000-crab biomedical quota rather than increase overall harvest pressure.

Horseshoe crabs are a public trust resource with significant ecological importance, and management decisions should reflect a commitment to conservation, transparency, and long-term population recovery.

Thank you for your serious consideration of these comments, especially at a time when many long-standing environmental protections are being weakened or eliminated.

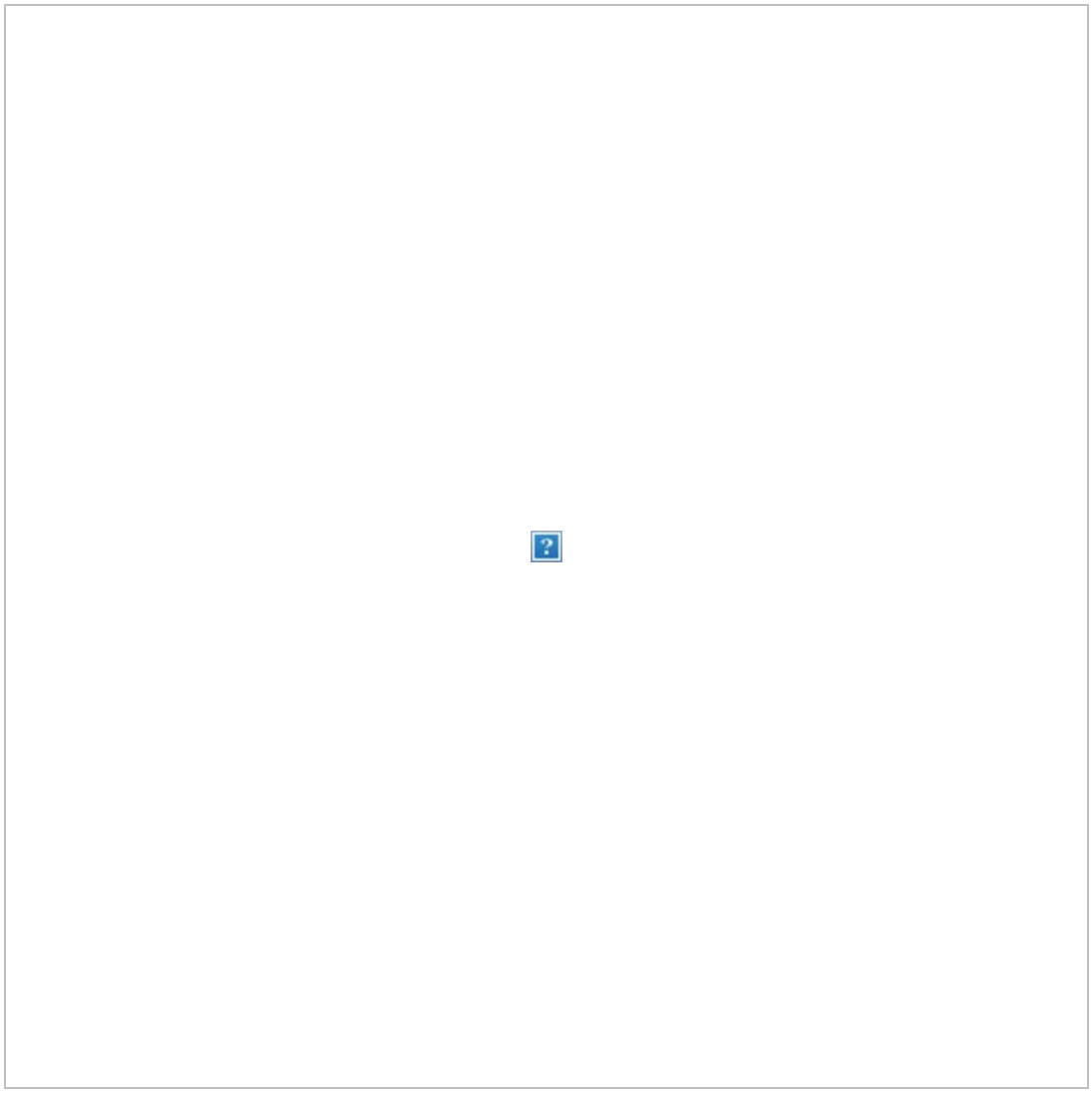
Sincerely,

Craig Maser

Mashpee, MA 02649

From: joyce meader
To: Marine Fish (FWE)
Subject: Action for Horseshoe Crabs!
Date: Tuesday, February 24, 2026 5:03:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.



a
Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
joyce meader
barnstable, MA

From: Helen Mangelsdorf
To: Marine Fish (FWE)
Subject: Protect the Horseshoe crabs
Date: Tuesday, February 24, 2026 3:15:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain or reduce the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Having lived near the Delaware River estuary for many years the experience of seeing a protected population of horseshoe crabs flourish and to be able to observe the millions of endangered migrating shore birds feeding on the eggs is a life-changing experience. To then move back to Massachusetts and learn that until last few years there was no protection for the horseshoe crabs at all. Massachusetts is still in the relative dark ages in our treatment of this ancient and important animal. Furthermore, there is now developed a synthetic replacement for the horseshoe crab blood. The horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Helen M. Mangelsdorf
West Falmouth, MA

From: paul_duf@verizon.net
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Tuesday, February 24, 2026 1:14:19 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Paul Duffy
Mattapoisett, MA

From: helenloz@verizon.net
To: Marine Fish (FWE)
Cc: sharl@horseshoecrabs.org
Subject: Horseshoe Crabs in Mass.
Date: Tuesday, February 24, 2026 1:11:38 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

To: Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident concerned about the future of Horseshoe Crabs and how it will be affected by the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

After what seemed like progress last year, I was surprised and disturbed to see the current DMF proposal going in the wrong direction entirely. Instead of helping to rebuild horseshoe crab populations in the state when it is known that they are still recovering from past over-harvesting, the proposal puts even more of them at risk. While the bait quota would be reduced, the new number still exceeds the actual bait needs as stated by the DMF. It makes no sense to continue supporting a failing industry to the detriment of another very important species, the horseshoe crab.

As far as biomedical harvesting, the proposed quota is a dramatic increase for no valid reason. Pharmaceutical companies are increasingly transitioning to a synthetic alternative to horseshoe crab blood, so the proposal to significantly raise them is a cruel and questionable move that would only benefit commercial interests. Some crabs do not survive the process at all, and the ones that survive it are left in a weakened state to the detriment of their health and spawning success.

Rather than using this moment to reduce pressure and rebuild horseshoe crab populations statewide, DMF's proposal moves in the opposite direction—prioritizing private commercial interests over long-term population recovery, ecosystem health, and resilience.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. To ensure the survival of horseshoe crabs, much better management plans and more sustainable practices are desperately needed as soon as possible.

It is beyond time for Massachusetts to join New York and Connectcut in conserving horseshoe crabs rather than intensifying their exploitation.

Thank you for your attention to this critical matter and for considering my comments.

Sincerely,
Helen Lozoraitis
Mattapoisett, MA

From: The Parlees
To: Marine Fish (FWE); McKiernan, Dan (FWE)
Subject: Attention: Director McKiernan
Date: Monday, February 23, 2026 9:25:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait replacing them with the invasive green crab and reduce given the option to transition to a man-made alternatives or at the very least maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Isabel Parlee
Essex, MA

From: Diana Di Gioia
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Monday, February 23, 2026 1:42:29 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Dear Director McKiernan,
I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.
Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.
Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.
Thank you for considering my comments.
Sincerely,
Diana Di Gioia
Barnstable, MA

From: Natty Hoffman
To: Marine Fish (FWE)
Subject: proposal to change horseshoe crab quotas
Date: Monday, February 23, 2026 1:30:53 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Natty Hoffman
Somerville, MA

From: Martha
To: Marine Fish (FWE)
Subject: horseshoe crabs
Date: Monday, February 23, 2026 10:41:38 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Attention: Director McKiernan - Horseshoe Crab Comments
Date: Monday, February 23, 2026 9:33:16 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: sarahbstewart@yahoo.com <sarahbstewart@yahoo.com>
Sent: Sunday, February 22, 2026 6:02 PM
To: Marine Fish (FWE) <marine.fish@mass.gov>
Cc: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Attention: Director McKiernan - Horseshoe Crab Comments

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.
Myself and my family care a lot about wildlife and animals in general. We have long been upset by the obvious decline of horseshoe crabs on our beaches. Horseshoe crabs are ancient animals surviving millions and millions of years and we are decimating them. And for no good reason.
There are other bait possibilities, obviously, and there are synthetic options for the medical uses. Please see all the well organized points below with links to more information as well.
But the main point is that we see no excuse for further horseshoe crab exploitation.
Please stop it all!!!

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain (or LOWER) the existing 200,000 biomedical quota, rather than expand overall harvest pressure. This is how other coastal states are behaving and let's not lag behind in a world of exploitation for no reason.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. Please end the use of horseshoe crab for bait and lower or end entirely the existing biomedical quota.

Please see further detailed points below and thank you for your careful attention to our concerns.

Sincerely, Sarah Stewart and Family
85 Garfield Street
Watertown, MA 02472

1. **Horseshoe Crabs Are a Public Trust Resource—** Horseshoe crabs are a public trust resource, not a private commodity. Management should prioritize the public interest, ecosystem health, and long-term sustainability—not private commercial convenience.
2. **Horseshoe Crabs Are a Keystone Species**— Horseshoe crabs are a keystone species, supporting migratory shorebirds, fisheries productivity, and coastal ecosystem health. Their decline impacts the coastal food web, harming wildlife and fisheries alike. Protecting horseshoe crabs directly advances Governor Healey's biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.
3. **Removing Crabs from Spawning Beaches Undermines Reproduction—** When a horseshoe crab is removed from a spawning beach before it spawns, there is no guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.
4. **Massachusetts Should End the Use of Horseshoe Crabs—** Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery and conservation.
5. **DMF's Proposal Expands Exploitation Instead of Reducing It—** The proposed management changes convert bait quota into biomedical take through the Rent-A-Crab program. Rather than reducing pressure on horseshoe crabs, this proposal expands exploitation at a time when conservation should be the priority.
6. **Biomedical Quota Increase—** In 2023, the Massachusetts Division of Marine Fisheries capped the biomedical horseshoe crab quota at 200,000 and split that quota evenly between the two existing processors. Now, DMF is proposing to raise the biomedical quota to 280,000 crabs, plus routing an additional 100,000 bait crabs through the rent-a-crab program. to the bleeding facilities. Ask why!
7. **Horseshoe Crabs Belong to the Public—** These animals are a public resource, not a private supply. Management decisions should prioritize long-term conservation and healthy coastal ecosystems—not expand access for private companies.
8. **Cruelty to Animals—** Some believe horseshoe crabs are incapable of feeling pain, even after repeated bleeding where needles pierce their hearts and 1/3 of their blood is drained. Animal rights organizations such as Humane World for Animals and Doctors

Against Animal Experiments disagree.

9. **Lack of Transparency Limits Public Oversight—** The so-called “rule of three,” derived from G.L. c. 130, §21, prevents disclosure of fisheries data unless at least three reporting entities are involved. Under the statute, such reports are held “strictly confidential by the director and shall not be disclosed except in compliance with a valid court order.” This policy limits transparency, obscures the true scale and impacts of horseshoe crab harvest and prevents meaningful public oversight of management decisions involving a public resource. We need to ask DMF to evaluate this non-public data as if horseshoe crab recovery were the first priority—and to explain how current harvest levels are consistent with conservation and the Commonwealth’s public trust responsibilities.
10. **Massachusetts Is Falling Behind Neighboring States—** Neighboring states are moving away from horseshoe crab exploitation. New York and Connecticut have taken stronger conservation action. Massachusetts should follow their lead and conserve horseshoe crabs before further declines become irreversible.
11. **There Is a Better Way—** As highlighted by The Boston Globe (Feb. 10, 2026), Massachusetts wants to bleed more horseshoe crabs. What if there was a better way. " Massachusetts is moving backward.”" **Synthetic alternatives exist, bait demand is declining, and conservation-first management is achievable—if Massachusetts chooses to lead rather than lag behind."**

From: Christina LeBedis
To: Marine Fish (FWE)
Subject: End horseshoe crabs for bait
Date: Sunday, February 22, 2026 9:38:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Christina LeBedis
Newton, MA

From: sarahbstewart@yahoo.com
To: Marine Fish (FWE)
Cc: McKiernan, Dan (FWE)
Subject: Attention: Director McKiernan - Horseshoe Crab Comments
Date: Sunday, February 22, 2026 6:02:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.
Myself and my family care a lot about wildlife and animals in general. We have long been upset by the obvious decline of horseshoe crabs on our beaches. Horseshoe crabs are ancient animals surviving millions and millions of years and we are decimating them. And for no good reason.
There are other bait possibilities, obviously, and there are synthetic options for the medical uses. Please see all the well organized points below with links to more information as well. But the main point is that we see no excuse for further horseshoe crab exploitation.
Please stop it all!!!

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain (or LOWER) the existing 200,000 biomedical quota, rather than expand overall harvest pressure. This is how other coastal states are behaving and let's not lag behind in a world of exploitation for no reason.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. Please end the use of horseshoe crab for bait and lower or end entirely the existing biomedical quota.

Please see further detailed points below and thank you for your careful attention to our concerns.

Sincerely, Sarah Stewart and Family
85 Garfield Street
Watertown, MA 02472

1. **Horseshoe Crabs Are a Public Trust Resource—** Horseshoe crabs are a public trust resource, not a private commodity. Management should prioritize the public interest, ecosystem health, and long-term sustainability—not private commercial convenience.
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biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.

3. **Removing Crabs from Spawning Beaches Undermines Reproduction—** When a horseshoe crab is removed from a spawning beach before it spawns, there is no guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.
4. **Massachusetts Should End the Use of Horseshoe Crabs—** Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery and conservation.
5. **DMF's Proposal Expands Exploitation Instead of Reducing It—** The proposed management changes convert bait quota into biomedical take through the Rent-A-Crab program. Rather than reducing pressure on horseshoe crabs, this proposal expands exploitation at a time when conservation should be the priority.
6. **Biomedical Quota Increase—** In 2023, the Massachusetts Division of Marine Fisheries capped the biomedical horseshoe crab quota at 200,000 and split that quota evenly between the two existing processors. Now, DMF is proposing to raise the biomedical quota to 280,000 crabs, plus routing an additional 100,000 bait crabs through the rent-a-crab program. to the bleeding facilities. Ask why!
7. **Horseshoe Crabs Belong to the Public—** These animals are a public resource, not a private supply. Management decisions should prioritize long-term conservation and healthy coastal ecosystems—not expand access for private companies.
8. **Cruelty to Animals—** Some believe horseshoe crabs are incapable of feeling pain, even after repeated bleeding where needles pierce their hearts and 1/3 of their blood is drained. Animal rights organizations such as Humane World for Animals and Doctors Against Animal Experiments disagree.
9. **Lack of Transparency Limits Public Oversight—** The so-called "rule of three," derived from G.L. c. 130, §21, prevents disclosure of fisheries data unless at least three reporting entities are involved. Under the statute, such reports are held "strictly confidential by the director and shall not be disclosed except in compliance with a valid court order." This policy limits transparency, obscures the true scale and impacts of horseshoe crab harvest and prevents meaningful public oversight of management decisions involving a public resource. We need to ask DMF to evaluate this non-public data as if horseshoe crab recovery were the first priority—and to explain how current harvest levels are consistent with conservation and the Commonwealth's public trust responsibilities.
10. **Massachusetts Is Falling Behind Neighboring States—** Neighboring states are moving away from horseshoe crab exploitation. New York and Connecticut have taken stronger conservation action. Massachusetts should follow their lead and conserve horseshoe crabs before further declines become irreversible.
11. **There Is a Better Way—** As highlighted by The Boston Globe (Feb. 10, 2026), Massachusetts wants to bleed more horseshoe crabs. What if there was a better way. " Massachusetts is moving backward."" **Synthetic alternatives exist, bait demand is declining, and conservation-first management is achievable—if Massachusetts chooses to lead rather than lag behind."**

From: Rich Walker
To: Marine Fish (FWE)
Subject: The Horseshoe Crab
Date: Sunday, February 22, 2026 6:01:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Rich Walker
Harwich MA

From: Joe Jerolimo
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Sunday, February 22, 2026 5:04:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident, Conservation Agent, and former employee of a major producer of limulus amebocyte lysate to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**. From my experience in the field I know that crabs harvested are often supplied by fishers, so having separate quotas for bait and biomedical use only complicates the issue of conservation. I also know there are viable alternatives to horseshoe crab amebocytes for the production of LAL on the horizon, but until they've passed the vigorous FDA testing required, horseshoe crab populations will continue to suffer.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Joe Jerolimo
Chatham, MA

From: Mike Wright
To: Marine Fish (FWE)
Subject: Save our horseshoe crabs
Date: Sunday, February 22, 2026 3:50:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

The DMF's own proposal acknowledges declining bait demand but expands the number of horseshoe crabs used for biomedical purposes. Horseshoe crabs have not fully recovered statewide, so this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize long-term population recovery.

They have been in our seas for such a long time, please let's protect them to insure that they are here far into the future too!

Thank you for considering my comments.

Sincerely,
Michael Wright
Provincetown, MA

From: Laura Eldridge
To: Marine Fish (FWE)
Subject: Save Horseshoe crabs - comment
Date: Sunday, February 22, 2026 1:15:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I have lived on the Cape for most of my life. I married into a Cape Cod family and we spend a lot of time in Cape Cod Bay and in Pleasant bay, walking and kayaking. It is evident from years spent on the water that there are fewer and fewer horseshoe crabs.

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Laura Eldridge

From: Harriett Emerson
To: Marine Fish (FWE)
Subject: Comment on Division of Marine Fisheries' current proposal to change horseshoe crab quotas.
Date: Sunday, February 22, 2026 12:49:07 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

My name is Harriett Emerson and I live in Eastham, MA. I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

I urge the DMF **to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

The DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Harriett Emerson
Eastham, MA

From:	Ellen D"Ovidio
To:	Marine Fish (FWE)
Subject:	Save our horse shoe crabs!!
Date:	Sunday, February 22, 2026 12:34:50 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Ellen D'Ovidio
Brewster, MA 02631

Sent from the all new AOL app for iOS

From: Suzanne McLeod
To: Marine Fish (FWE)
Subject: Attn: Director McKiernan - maintain horseshoe crab quotas, use synthetic alternatives to bleeding
Date: Sunday, February 22, 2026 11:11:54 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal regarding horseshoe crab quotas.

The DMF's own proposal acknowledges declining bait demand while expanding the number of crabs used for biomedical purposes. Given that horseshoe crabs have not fully recovered statewide, I believe this is the appropriate time to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than increasing overall harvest pressure.

Massachusetts should join neighboring states like Connecticut and New York in recognizing the decreased need for bait and the irreplaceable role horseshoe crabs play in our stressed ecosystem. Prioritizing the conservation of this public resource over its commodification is essential. I urge the DMF to take an ethical, long-term view by supporting synthetic alternatives to biomedical bleeding.

Horseshoe crabs are a public trust resource with critical ecological value. Management decisions should prioritize conservation, transparency, and long-term population recovery. With synthetic alternatives available and bait demand declining, Massachusetts has the opportunity to lead in conservation-first management.

Thank you for considering my comments.

Sincerely,
Suzanne McLeod

Suzanne McLeod
Arlington, MA

Virus-free.www.avast.com

From: Dianne WALSH
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Sunday, February 22, 2026 10:07:37 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan
Director of Marine Fisheries Division
Dear Mr. McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Dianne Walsh
573 Main Street
West Barnstable, MA 02668
774-994-2825

From: Ann Fay Michaels
To: Marine Fish (FWE)
Cc: Ann Michaels
Subject: Horseshoe Crab Issue
Date: Sunday, February 22, 2026 8:06:55 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Ann Fay Michaels
36 Crosby Lane
Brewster, MA 02631

From: Jennifer Bergen
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Sunday, February 22, 2026 6:27:06 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Jennifer Bergen
Eastham, MA

From: John Corsini
To: Marine Fish (FWE)
Date: Sunday, February 22, 2026 4:24:17 AM

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Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
John Corsini
Dennis, MA

From: jessica tsoukalas
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Sunday, February 22, 2026 2:14:55 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Jessica Tsoukalas
Brewster, MA

From: Steven Lowther
To: Marine Fish (FWE)
Subject: Attn. Director McKiernan: Horseshoe Crabs
Date: Sunday, February 22, 2026 1:20:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Steve Lowther
Eastham, MA 02642

From: Gisela Tillier
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Saturday, February 21, 2026 10:27:51 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

As a Massachusetts resident I'm writing to you to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Gisela Tillier
Falmouth, MA

From: Brooke Shellman
To: Marine Fish (FWE)
Subject: Comment on the DMF Proposal to Change Horseshoe Crab Quotas
Date: Saturday, February 21, 2026 9:07:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Brooke Shellman
Provincetown, MA

From: Claudia Shwide-Slavin
To: Marine Fish (FWE)
Subject: Fwd: Take Action for Horseshoe Crabs!
Date: Saturday, February 21, 2026 6:45:50 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Claudia Shwide-Slavin
Claudiasslavin@gmail.com
917-837-1459

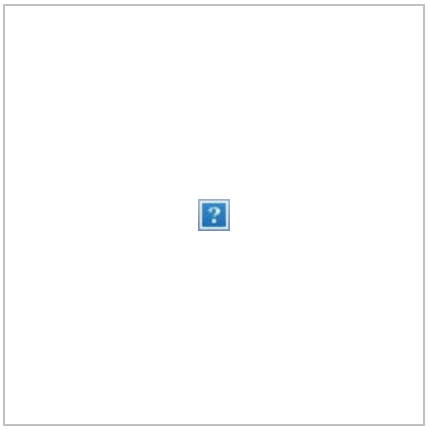
Truro, MA 02666

Thanks to the Southeastern Massachusetts Pine Barrens Alliance for contributing to the above content.

Our Contact Information
Association to Preserve Cape Cod
482 Main St.
Dennis, MA 02638
(508) 619-3185

https://apcc.org/

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APCC is an equal opportunity provider and employer.

From: Jimmy Henry
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan: Protect Horseshoe Crabs
Date: Saturday, February 21, 2026 5:27:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
James Henry
Centerville, MA

Sent from my iPhone

From: Paula Tredeau
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Saturday, February 21, 2026 4:34:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. Moreover, the fascination of seeing these amazing creatures is one of the true joys of our coastal waters. Our grandsons continue to value and treasure our marine resources as my husband and I have over the years.

Thank you for considering my comments.

Kindly,
Paula C. Tredeau
7 Langley Road
Falmouth, MA 02540

From: steve larsen
To: Marine Fish (FWE)
Subject: Horseshoe Crab Conservation
Date: Saturday, February 21, 2026 3:53:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

2/21/2026

Attention: Dan McKiernan,
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I'm a Massachusetts resident who lives on Cape Cod and would like to weigh in on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Considering the declining horseshoe crab bait demand and the expanded use of horseshoe crabs used for biomedical purposes, and the fact that horseshoe crabs have not fully recovered statewide, it's an appropriate time to end the use of horseshoe crabs for bait and while maintaining the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public resource with critical ecological value, and management decisions should prioritize conservation and long-term population recovery.

Thank you for your consideration,

Sincerely,
Steve Larsen
40 Salt Marsh Way
Eastham, MA

From: Jill P Hillier
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Saturday, February 21, 2026 3:09:06 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Jill P Hillier
Eastham, MA

From: Ellie Zucker
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Saturday, February 21, 2026 3:01:24 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Additionally, as a parent who has raised two children on Cape Cod, I have personally seen how horseshoe crabs capture the attention and imagination of our youth, helping them to appreciate the need for continued protection and conservation of our fragile coastal ecosystems.

Thank you for considering my comments.

Sincerely,
Eleanor Zucker
Orleans, MA

From: POCCA CAPE COD
To: Marine Fish (FWE)
Subject: Horseshoe crab moment to end use this way
Date: Saturday, February 21, 2026 2:51:06 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Laura Kelley
North Eastham, MASS

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--
Laura Kelley
774.353.6511
POCCA Cape Cod ~ Protect Our Cape Cod Aquifer ~
Helping to protect our quality of life on Cape Cod
President: Protect Our Cape Cod Aquifer (POCCA)
Facebook: POCCA Cape Cod



From: William Allan
To: Marine Fish (FWE)
Subject: DMF Proposed Quotas on Horseshoe Crabs
Date: Saturday, February 21, 2026 2:06:28 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
William H Allan
Eastham, MA 02642

From: ron pikul
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quota
Date: Saturday, February 21, 2026 1:23:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Dear Director McKiernan,
I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.
Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.
Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.
Thank you for considering my comments.
Sincerely,
Ron Pikul
Forestdale Ma 02644

As Ron White said, 'YOU CAN'T FIX STUPID'

From: Stephen Manzi
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Saturday, February 21, 2026 11:50:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts homeowner (part-time resident of Eastham on Cape Cod) to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Please: help protect these extraordinary creatures. Thank you.

Warm regards,

Stephen Manzi
Eastham, MA and Pleasantville, NY

From: J F
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Saturday, February 21, 2026 11:31:28 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

We see that the Division of Marine Fisheries' proposal to change horseshoe crab quotas recognizes shrinking demand for bait along with increasing use of horseshoe crabs for biomedical applications, and that horseshoe crab populations remain low across the Commonwealth.

By DMF's own reckoning, Massachusetts needs to stop using horseshoe crabs for bait, and safeguard the current 200,000 needed for biomedical uses. There are no circumstances to justify increasing harvesting at this time.

As a public good of enormous environmental consequence, horseshoe crabs call for transparent public policies that put protection first.

Thank you for considering my comments.

Sincerely,

Jack Fracasso
96 Canoe Pond Drive
Brewster MA 02631

From: Eric Schwam
To: Marine Fish (FWE)
Subject: horseshoe Crab quotas Proposal
Date: Saturday, February 21, 2026 11:07:13 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Email to: marine.fish@mass.gov
Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Eric Schwam
Brewster, MA

From: John Ponte
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Saturday, February 21, 2026 11:00:09 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
John Ponte
Cotuit, MA

Sent from my iPhone

From: Geert Kinthaert
To: Marine Fish (FWE)
Subject: Horseshoe crab concern
Date: Saturday, February 21, 2026 9:49:34 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain or reduce the existing 200,000 biomedical quota, rather than expand overall harvest pressure**. The bait usage is akin to throwing these beings into the trash heap, and the biomedical use is simply a money grab, largely benefiting private companies and equity firms, NOT the public at large. There is a high level of mortality with current practices, and effort should be taken to reduce that mortality rate by investigating different and more effective fluid extraction procedures.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Geert Kinthaert
Cummaquid, MA 02637

From: Sharon Nunes
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Saturday, February 21, 2026 8:50:56 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

I understand that DMF's own proposal acknowledges that there is declining demand for horseshoe crab bait. Since the horseshoe crab population has not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait.** Maintaining the number of horseshoe crabs used for biomedical purposes, should be a priority so I strongly recommend **maintaining the existing 200,000 biomedical quota, rather than expanding the overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely, Sharon Nunes
Falmouth. MA

Sharon Nunes
Chair, The Falmouth Fund of The Cape Cod Foundation
Member, National Academy of Engineering

From: Amy Travis
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Saturday, February 21, 2026 7:17:25 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Amy Travis
Lincoln, MA

From: Dan Horn
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Saturday, February 21, 2026 6:44:20 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Daniel J. Horn
Marstons Mills, MA

From: susan c
To: Marine Fish (FWE)
Subject: ATTN: DAN MCKIERNAN, DIRECTOR
Date: Saturday, February 21, 2026 6:42:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
SUSAN E CALLAN
FALMOUTH, MA

From: Rachel Wiseman
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Saturday, February 21, 2026 6:14:52 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Email to:
Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Rachel Wiseman
Mashpee, MA

From: Pamela Tomkinson
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Saturday, February 21, 2026 6:11:13 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Pamela Tomkinson
Brewster, MA

From: Lou-Anne Conroy
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Saturday, February 21, 2026 5:47:39 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident and educator to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas. I teach 300 high school students in my Oceanography course a year. I include a unit on horseshoe crabs. Every year my students are shocked that there are as many horseshoe crabs that are allowed to be harvested and allowed to be bled given the low population numbers and the many environmental obstacles these ancient animals are impacted by. The students understand these animals are a keystone species and our fisheries depend on them, migratory birds depend on them and marine food webs need them to be healthy.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

We ask you to include more oversight of how horseshoe crabs are treated/handled when brought to the bleeding facility. There can be more care given to these valuable animals and more monitoring to insure better care.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Lou-Anne Conroy
West Barnstable,MA

From: DEBRA DAVIDSON
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Saturday, February 21, 2026 5:20:18 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Debra Davidson
60 Holder Lane
West Barnstable, MA

From: K.S. O"Brien
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Saturday, February 21, 2026 4:55:40 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am reaching out to you regarding the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. I recall as a child growing up on the bay in Yarmouth Port that there were an abundance of horseshoe crabs everywhere. That is not the case anymore. It is evident the population has significantly declined and needs our help.

Thank you for your consideration.

Sincerely,
Kate O'Brien
Truro MA

From: Christine Cdchil
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Friday, February 20, 2026 11:29:20 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Christine Chilingerian
Cambridge MA

From:	Catherine Finkenstaedt
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Friday, February 20, 2026 6:49:25 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Please help preserve their numbers and value to our enviroment.

Thank you so much for taking the time to take this into consideration

Sincerely,
Catherine Finkenstaedt
West Barnstable, MA

Catherine Finkenstaedt
catfinkusa@yahoo.com
310 500 5513 c.

From: Betty Logan
To: Marine Fish (FWE)
Subject: horseshoe quotas
Date: Friday, February 20, 2026 6:36:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Elizabeth Logan
West Yarmouth, MA

Justice will not be served until those who are unaffected are as outraged as those who are.
Ben Franklin

From: Holiday Houck
To: Marine Fish (FWE)
Subject: horseshoe crabs
Date: Friday, February 20, 2026 6:27:31 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Holiday Houck
Boston, MA

From: Michael Rudden
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 6:08:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Michael Rudden
259 Spruce Road
Harwich, MA 02645
msrarch@gmail.com

From: lpseymour@comcast.net
To: Marine Fish (FWE)
Subject: Horseshoe Crab quotas
Date: Friday, February 20, 2026 5:59:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and lower the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Lynn Seymour
Dartmouth MA

From: Sharon Topper
To: Marine Fish (FWE)
Subject: horseshoe crabs are amazing creatures
Date: Friday, February 20, 2026 5:54:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

We are writing as Massachusetts residents to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Plus, horseshoe crabs are amazing creatures!

Thank you for considering our comments.

Sincerely,
Sharon Topper & Zoe Lewis
[Provincetown, MA]

From: Chris Mosher
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Friday, February 20, 2026 5:48:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Christopher Mosher
Natick, MA

Sent from my iPhone

From: Ruby Ackert-Herzig
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 5:35:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Ruby P. Ackert-Herzig
Waquoit, MA

From: dianne chilingerian
To: Marine Fish (FWE)
Subject: Attention: Director Dan McKiernan
Date: Friday, February 20, 2026 5:27:32 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Mrs. Dianne I. Chilingerian

Mashpee, MA

From: mdefelice@rcn.com
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 5:13:24 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

I have been visiting Cape beaches for more than 60 years and have long noticed the declining numbers of these remarkable creatures. Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Maria DeFelice
43 Wayside Inn Rd.
Framingham

From:	Diane M. Boucher
To:	Marine Fish (FWE)
Subject:	Horseshoe crab quotas
Date:	Friday, February 20, 2026 4:59:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

As a volunteer horseshoe crab survey counter in Massachusetts, I have seen the difference that quotas can make for these amazing creatures.

I would like to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Diane M. Boucher
Sandwich, Massachusetts

From: Terrie Boguski
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Friday, February 20, 2026 4:58:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts summer resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

NOAA Fisheries has denied Endangered Species Act protection for the horseshoe crab. Even though environmental groups are suing to try change this decision, it appears that it is up to the States to protect our marine resources.

DMF indicates that the horseshoe crab population has not recovered statewide. It seems inadvisable to set overall quotas higher than the current quotas. Please **end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Terrie Boguski
50 Fenway Rd.
Dennisport, MA 02639

From: Richard Kramer
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Friday, February 20, 2026 4:57:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attn: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

G. Richard Kramer
148 Nyes Neck Road E
Centerville, MA 01632

From: Tom Weaver
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 4:40:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Thomas Weaver
Falmouth, MA

From: Scott Kerns
To: Marine Fish (FWE)
Cc: Jennifer.Armini
Subject: Horseshoe Crab Quotas
Date: Friday, February 20, 2026 4:40:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end, or reduce, the use of horseshoe crabs for bait, and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

How important is the Whelk/Conch Fishery (the primary user of horseshoe crab bait in Massachusetts) in Massachusetts?

Horseshoe crabs are of critical ecological value, and management decisions should prioritize conservation and long-term population recovery.

Sincerely,

Scott Kerns
69 Pond St.
Marblehead, MA 01945

From: Mark Bernasconi
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Friday, February 20, 2026 4:33:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and END the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

There are alternative baits.

There are more reliable synthetic alternatives for biomedical uses.
See University of Michigan News article "

Why isn't the pharmaceutical industry using this alternative to horseshoe crab blood?

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, public safety and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Mark Bernasconi
Franklin, MA

--
Mark Bernasconi
251 928 7107

From: Susan Whitlock
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 4:20:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I grew up in Gloucester, Massachusetts, combing beaches and tide pools with my brothers. It was a rare but precious moment whenever we found a horseshoe crab--I think we instinctively understood and respected their ancient lineage. I'm writing now to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Though I live primarily in Michigan now, I visit Massachusetts regularly and still care deeply about its maring creatures. thank you for considering my comments and those of so many current residents of Massachusetts.

Sincerely,
Susan B. Whitlock
Ann Arbor, MI 48105

--
"The tranquil heart may yet outrun the rocket and the car." --E. B. White

From: Jo-Anne Wilson-Keenan
To: Marine Fish (FWE)
Subject: Change to horseshoe crab quotas--Attention Dan McKiernan, Director Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 4:16:14 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas. **Horseshoe crabs cannot speak for themselves, so I am speaking for them.**

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Jo-Anne Wilson-Keenan, Ed.D.
East Dennis, Massachusetts
Jo-Anne Wilson-Keenan, Ed.D.
Keenan Literacy and Learning
Keenanliteracy.com
508-694-6315
413-537-2283

Resistance is a revolt of the heart and mind against an invader who violates human rights...

Genevieve de Gaulle

Quaerens lucem

From: Stanley Selkow
To: Marine Fish (FWE)
Subject: Over exploitation of Horseshoe Crabs
Date: Friday, February 20, 2026 4:15:52 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Dr. Stanley and Ms. Deborah Selkow
27 Catherine Rose Rd
Harwich, MA 02645

From: Gini Giuliani
To: Marine Fish (FWE)
Subject: Horseshoe Crab Preservation
Date: Friday, February 20, 2026 4:08:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine

Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

I live on Cape Cod Bay and have personally noticed the substantial decline in the population of this wonderful and previous species.

Thank you for considering my comments.

Regards,
Gini Giuliani
121 Taunton Avenue
Dennis, MA

Yahoo Mail: Search, Organize, Conquer

From: Susan Surette
To: Marine Fish (FWE)
Subject: Proposal to change horseshoe crab quotas
Date: Friday, February 20, 2026 4:03:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Susan M. Surette
Cotuit, MA 02635

From: Larry Carr
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quota Proposal
Date: Friday, February 20, 2026 3:54:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering these comments. Please take the necessary leadership actions to reduce the overall harvest of this precious natural resource.

Sincerely,
Larry Carr and Paula Gulbicki
Yarmouth Port, MA 02675

From: PAUL BIBO
To: Marine Fish (FWE)
Subject: horseshoe crab proposal
Date: Friday, February 20, 2026 3:53:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Paul S. Bibo
Mashpee MA 02649
617-519-8868

From: saraslater1818@aol.com
To: Marine Fish (FWE)
Subject: Division of Marine Fisheries' current proposal to change horseshoe crab quotas
Date: Friday, February 20, 2026 3:53:38 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident and native Cape Codder to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Sara Colton
Sandwich, MA 02563

From: K. E. Sekararum
To: Marine Fish (FWE)
Subject: Protecting Horseshoe Crabs
Date: Friday, February 20, 2026 3:51:19 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Cape Cod resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Horseshoe crabs are important in coastal ecosystems:

- Their eggs are a critical food source for migratory shorebirds, including the threatened red knot.
- They are slow to mature, taking 11 years to reach reproductive size, making them highly vulnerable to overharvesting.
- Horseshoe crabs play an important role in the coastal food web, supporting several commercially valuable fish.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

This is a critical moment for us to expand environmental protections, not reduce them. I consider myself a part of a Cape Cod community that is not exclusive to the humans who inhabit this beautiful area, but inherently includes all of the creatures who reside here.

Thank you for considering my comments.

Sincerely,
K.E. Schrieber
Falmouth, MA

—

Dr. K. E. Schrieber, DMA
kesekararum@icloud.com

From: Beverly Bender
To: Marine Fish (FWE)
Subject: Horseshoe Crab Protection
Date: Friday, February 20, 2026 3:40:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Bonnie Bender
Dennis, MA

From: Stacey Cooper
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Friday, February 20, 2026 3:23:11 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Stacey Cooper
Native Plant Propagation Manager

Nantucket Conservation Foundation
P.O. Box 13 (mailing address)
118 Cliff Road (physical address)
Nantucket, MA 02554
508-228-2884

Nantucket Conservation Foundation

Support our mission by clicking here

From:	Sarah Eslick
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Friday, February 20, 2026 3:18:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Sarah Eslick
Southborough, MA and Harwich, MA

From: Joan Brunetta
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 3:17:11 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Joan Brunetta
Somerville, MA

From:	Joanna Stevens
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Friday, February 20, 2026 3:09:28 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Joanna Stevens
Eastham, MA

From: Sherrie B
To: Marine Fish (FWE)
Subject: Reduce Horseshoe Crab Quotas
Date: Friday, February 20, 2026 3:04:02 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

As a Massachusetts resident I am writing to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an opportune time to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Sherrie Burson
South Chatham, MA

From: Teagan Connelly
To: Marine Fish (FWE)
Subject: Proposed Quotas Concern
Date: Friday, February 20, 2026 3:03:49 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' (DMF) current proposal to adjust horseshoe crab quotas.

Given that the DMF proposal acknowledges declining bait demand while simultaneously expanding the number of horseshoe crabs used for biomedical purposes—and considering that populations have not fully recovered statewide—I believe this is the appropriate time to end the use of horseshoe crabs for bait. Furthermore, I urge the Division to maintain the existing 200,000 biomedical quota rather than increasing overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value. Management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for your time and for considering my comments.

Sincerely,

Teagan Connelly
Sagamore Beach, MA

From: Ocean Silver
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 3:03:32 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Ocean Silver
Harwich, MA

From: Marci Johnson
To: Marine Fish (FWE)
Subject: Please Help Save the Horseshoe Crabs!
Date: Friday, February 20, 2026 2:56:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Cape Cod resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Marcia Johnson
Harwich, MA 02645

From: David P Herrick
To: Marine Fish (FWE)
Subject: Protect Horseshoe Crabs
Date: Friday, February 20, 2026 2:53:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

David Herrick

David.P.Herrick
163 Beach Rd.
Orleans, MA 02653
(617) 840-8199

From: Jane Lowey
To: Marine Fish (FWE)
Subject: Horse shoe crab quotas
Date: Friday, February 20, 2026 2:48:55 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. And what's more - we love them as a natural part of our year round life here on Cape Cod.

Thank you for considering my comments.

Sincerely,
Jane Lowey
Brewster, MA 02631

From: Katharine Ellsworth
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan- Save horseshoe crabs!
Date: Friday, February 20, 2026 2:47:37 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Kate Ellsworth

From: Deborah Reiter
To: Marine Fish (FWE)
Subject: horseshoe crabs
Date: Friday, February 20, 2026 2:44:29 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

This is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Thank you for considering my comments.

Deborah Reiter
Amherst, MA

From: Madalyn Hillis-Dineen
To: Marine Fish (FWE)
Subject: Save Our Horseshoe Crabs!
Date: Friday, February 20, 2026 2:38:58 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Madalyn Hillis-Dineen
Brewster, MA

--
Madalyn Hillis-Dineen
Vice President, Sales and Marketing
Astrolabe, Inc.

From: Andrew Nelson
To: Marine Fish (FWE)
Subject: Save the horseshoe crab
Date: Friday, February 20, 2026 2:33:05 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Lets heed the lessons of the past. We have lost so many marine species. This one has been around for over 400 million years. I want them to be around for my grandchildren, and their grandchildren.

Thank you for considering my comments.

Sincerely,
Andrew Nelson
Sent from my iPhone

From: Steven Ostrosky
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Friday, February 20, 2026 2:28:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Steven Ostrosky
Buzzards Bay,MA

Steven Ostrosky

From: Laurie Gates
To: Marine Fish (FWE)
Subject: Horseshoe crab proposal
Date: Friday, February 20, 2026 2:26:46 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Laurie Gates
38 Dusty Miller Lane
S. Chatham, MA 02658

From: CW
To: Marine Fish (FWE)
Subject: Re. Horseshoe crab quota
Date: Friday, February 20, 2026 2:26:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Cape Cod resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Charles Williams
Marstons Mills, MA

Sent with MySudo

From: Bettina Abe
To: Marine Fish (FWE)
Subject: End the use of horseshoe crabs for bat and maintain existing quota
Date: Friday, February 20, 2026 2:26:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure. Personally, I would prefer a much smaller quota, but this is at least a start.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Bettina Abe
125 School Street
Acton, MA 01720

From: M Wong-Sommer
To: Marine Fish (FWE)
Subject: Save horseshoe crabs!
Date: Friday, February 20, 2026 2:24:22 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Mary Wong-Sommer
354 Stony Brook Rd
Brewster, MA 02631

From: Jennifer Goldstein
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Friday, February 20, 2026 2:18:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**. I'm not even sure why the biomedical quota needs to be included as there is a synthetic version of this compound now available.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. I grew up on West Bay in Osterville, and as a child I remember seeing horseshoe crabs all the time but now it's a rare site. Until there is a clearer picture of the health of the population, harvesting should be reduced.

Thank you for considering my comments.

Sincerely,

Jennifer Goldstein
140 Shawmut Ave, #8A
Boston MA 02118

From: JD HARRIS
To: Marine Fish (FWE)
Subject: Horseshoe crabs used for biomedical purposes
Date: Friday, February 20, 2026 2:18:02 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
John D. Harris
Sandwich, MA 02563

From: Jan Crabtree
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Friday, February 20, 2026 2:13:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sent from my iPad

From: Melissa Bird
To: Marine Fish (FWE)
Subject: Att: Dan McKiernan, Dir Ma Div. Marine Fisheries
Date: Friday, February 20, 2026 2:12:28 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Cape Cod Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for your consideration,

Sincerely,
Melissa Bird
Harwich, MA

From: Martha Hally
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas
Date: Friday, February 20, 2026 2:11:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments, PLEASE protect these animals who have been here longer than we have!

Sincerely,
Martha Hally
Eastham, MA

From: Michael Lindgren
To: Marine Fish (FWE)
Subject: HorseShoe Crabs
Date: Friday, February 20, 2026 2:11:10 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Cape Cod Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and reduce the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Michael Lindgren
Brewster, MA

From:	rachel moonshadowmedia.com
To:	Marine Fish (FWE)
Subject:	Attn: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Friday, February 20, 2026 2:08:00 PM
Attachments:	image001.png
Importance:	High

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Rachel Smith-Cote
Wellfleet, MA

rachel smith-coté | moonshadowmedia.com | 404.295.3169

MOONSHADOW
MEDIA

From: LA Dev
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 2:03:53 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

Thank you for the good work you do to protect Cape Cod's environment.

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

I've witnessed drastic decline in the horseshoe crab population in my 60+ years on Cape Cod. Be a change agent now, while you have power. Please.

Thank you for considering my comments.

Best,
Lorri Devlin
Mashpee, MA

From:	Weskate
To:	Marine Fish (FWE)
Cc:	Anne O"Neill
Subject:	Attn: Dan McKiernan, Director of MA Division of Marine Fisheries
Date:	Friday, February 20, 2026 2:01:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I grew up on Cape Cod and would like to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas. These crabs were in abundance when I was growing up on the Cape, and they never ceased to amaze us, in terms of their intriguing history and being a vital part of the ecosystem.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Anne O'Neill
from Yarmouthport, MA

From: Jan Lombard
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Friday, February 20, 2026 2:00:53 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.
Sincerely,
Jan Lombard
E. Sandwich Mass.

From: John Savignano
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan, Director, MA division of marine fisheries
Date: Friday, February 20, 2026 2:00:05 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,
I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
John Savignano
West Yarmouth MA

From: Derek Scace
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Friday, February 20, 2026 1:56:09 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Derek Scace

Sandwich, MA

From:	Kim Hudson
To:	Marine Fish (FWE)
Subject:	Subject: Horshoecrabs / Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Friday, February 20, 2026 1:53:48 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Kim Hudson
Harwich, MA 02645

From: Susan Brinckerhoff
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Friday, February 20, 2026 1:53:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**. This so important for the development of new medicines and for keeping a steady availability of horseshoe crabs.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Susan Brinckerhoff
Yarmouth Port, MA 02675

From: Olivia
To: Marine Fish (FWE)
Subject: Protect Horseshoe Crabs
Date: Friday, February 20, 2026 1:52:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident and a PhD candidate in Ecology at SUNY ESF. I would like to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. Horseshoe crabs are a critical part of the ecology, food web, and marine health of Massachusetts and we should be prioritizing keeping populations abundant. I urge you to end the use of horseshoe crabs as bait.

Thank you for considering my comments.

Sincerely,

Olivia Kurz
Falmouth, MA

From: Lisa Zuar
To: Marine Fish (FWE)
Subject: Please save our Horseshoe crabs
Date: Friday, February 20, 2026 1:49:16 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely'
Lisa H. Zuar
West Falmouth, MA

Sent from my iPad

From: Zach Swift
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 1:45:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to provide comments on the Division of Marine Fisheries' proposed changes to horseshoe crab quotas.
Given that the proposal itself notes a decline in bait demand, alongside an increase in horseshoe crabs allocated for biomedical use, and considering that statewide populations have not yet fully recovered, this is an appropriate moment to end the use of horseshoe crabs for bait. Maintaining the existing biomedical quota of 200,000-rather than expanding overall harvest pressure-would better support long-term sustainability.
Horseshoe crabs are a public trust resource with significant ecological importance, and management decisions should reflect a commitment to conservation, transparency, and the recovery of healthy populations.

Thank you for your consideration.

Zach Swift
Barnstable,MA

From: Melissa Tomlinson
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 1:43:20 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I live on Cape Cod and am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

I believe that since DMF's own proposal recognizes declining demand for bait while increasing the number of horseshoe crabs allocated for biomedical use—and given that statewide populations have not fully recovered—this is the right time to end the use of horseshoe crabs for bait and keep the current 200,000-crab biomedical quota in place (frankly, I'd rather it were reduced), rather than increasing overall harvest pressure.

Horseshoe crabs are sentient beings with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery. And, it is the right thing to do.

Thank you for considering my comments.

Sincerely,

Melissa Tomlinson
Centerville, MA

From: Robin Herzog
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quotas Proposal
Date: Friday, February 20, 2026 1:43:15 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Robin Herzog

From: themaplekind11
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quota Change
Date: Friday, February 20, 2026 1:42:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Donna Wright
Mashpee, MA

From: Jordan Mora
To: Marine Fish (FWE)
Subject: Help protect this 450-million-year-old species
Date: Friday, February 20, 2026 1:42:00 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Jordan Mora
Woods Hole, MA

Jordan Mora
(she/her)
Lead Ecologist & Science Advisor
Ecosystem Restoration Program | Association to Preserve Cape Cod
508-619-3185 x 310
jmora@apcc.org
www.apcc.org

APCC is an equal opportunity provider and employer.

From: jenni7k@gmail.com
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 1:41:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Please help to preserve these cherished dinosaurs and our environment!

Thank you for considering my comments.

Sincerely,

Jennifer Knight
Yarmouthport, MA

From: Laura Notarangelo
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 1:40:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Laura Notarangelo
East Falmouth, MA

From: Patricia Walton
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Friday, February 20, 2026 1:39:53 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, **this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure**.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Patricia T. Walton
Harwich Port, MA 02646

From: Leslie Kramer
To: Marine Fish (FWE)
Subject: Horseshoe Crabs: PROTECT!
Date: Friday, February 20, 2026 5:29:12 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am as Massachusetts resident issuing my comments on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Your own DMF's proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes. You acknowledge that horseshoe crabs - a KEYSTONE species in the ecosystem - have not fully recovered all along the East Coast and beyond.

This is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure. Harvest pressure affects and endangers this and any species survival.

Shorebirds, shoreline life forms, and the environment expect you to make the informed decision: leave Horseshoe Crabs alone.

Leslie Kramer
Medford, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe Crabs Are A Keystone Species
Date: Thursday, February 19, 2026 9:50:22 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Melissa Bird <nursebird@gmail.com>
Sent: Wednesday, February 18, 2026 7:02 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Horseshoe Crabs Are A Keystone Species

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Melissa Bird
Harwich, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horsehoe Crabs
Date: Thursday, February 19, 2026 9:49:56 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Bob Shriber <bobshriber@gmail.com>
Sent: Wednesday, February 18, 2026 11:07 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Horsehoe Crabs

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Bob Shriber
Aquinnah, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Better protect, not kill, Horseshoe crabs
Date: Wednesday, February 18, 2026 3:41:25 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Jon Way <easterncoyoteresearch@yahoo.com>
Sent: Wednesday, February 18, 2026 3:33 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Better protect, not kill, Horseshoe crabs

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Protect horseshoe crabs - February 2026

To: dan.mckiernan@mass.gov

Dear Mass DMF,

I can't believe how special, extractive/consumptive uses dominant our natural resources here even in supposedly "liberal" Massachusetts. There have been many attempts to better protect horseshoe crabs and now you want to allow more "harvest' of them all while other states are banning the harvest of them. Wake up and protect horseshoe crabs for the following reasons.

1. **Horseshoe Crabs Are a Public Trust Resource—** Horseshoe crabs are a public trust resource, not a private commodity. Management should prioritize the public interest, ecosystem health, and long-term sustainability—not private commercial convenience.
2. **Horseshoe Crabs Are a Keystone Species**— Horseshoe crabs are a keystone species, supporting migratory shorebirds, fisheries productivity, and coastal ecosystem health. Their decline impacts the coastal food web, harming wildlife and fisheries alike. Protecting horseshoe crabs directly advances Governor Healey's biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.
3. **Removing Crabs from Spawning Beaches Undermines Reproduction—** When a horseshoe crab is removed from a spawning beach before it spawns, there is no

guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.

4. **Massachusetts Should End the Use of Horseshoe Crabs—** Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery and conservation.
5. **DMF's Proposal Expands Exploitation Instead of Reducing It—** The proposed management changes convert bait quota into biomedical take through the Rent-A-Crab program. Rather than reducing pressure on horseshoe crabs, this proposal expands exploitation at a time when conservation should be the priority.
6. **Biomedical Quota Increase—** In 2023, the Massachusetts Division of Marine Fisheries capped the biomedical horseshoe crab quota at 200,000 and split that quota evenly between the two existing processors. Now, DMF is proposing to raise the biomedical quota to 280,000 crabs, plus routing an additional 100,000 bait crabs through the rent-a-crab program to the bleeding facilities. Why?
7. **Horseshoe Crabs Belong to the Public—** These animals are a public resource, not a private supply. Management decisions should prioritize long-term conservation and healthy coastal ecosystems—not expand access for private companies.
8. **Cruelty to Animals—** Some believe horseshoe crabs are incapable of feeling pain, even after repeated bleeding where needles pierce their hearts and 1/3 of their blood is drained. Animal rights organizations such as Humane World for Animals and Doctors Against Animal Experiments disagree.
9. **Lack of Transparency Limits Public Oversight—** The so-called "rule of three," derived from G.L. c. 130, §21, prevents disclosure of fisheries data unless at least three reporting entities are involved. Under the statute, such reports are held "strictly confidential by the director and shall not be disclosed except in compliance with a valid court order." This policy limits transparency, obscures the true scale and impacts of horseshoe crab harvest and prevents meaningful public oversight of management decisions involving a public resource. We need to ask DMF to evaluate this non-public data as if horseshoe crab recovery were the first priority—and to explain how current harvest levels are consistent with conservation and the Commonwealth's public trust responsibilities. These laws sound more like Trump policy with no accountability; this doesn't even remotely involve any science which your organization is supposed to follow.
10. **Massachusetts Is Falling Behind Neighboring States—** Neighboring states are moving away from horseshoe crab exploitation. New York and Connecticut have taken stronger conservation action. Massachusetts should follow their lead and conserve horseshoe crabs before further declines become irreversible. It is inexcusable that you

are trending the opposite direction of this trend. Inexcusable!

11. **There Is a Better Way—** As highlighted by The Boston Globe (Feb. 10, 2026), Massachusetts wants to bleed more horseshoe crabs. What if there was a better way. " Massachusetts is moving backward."" **Synthetic alternatives exist, bait demand is declining, and conservation-first management is achievable—if Massachusetts chooses to lead rather than lag behind.**

Just like MassWildlife's hell-bent approach to allowing hunting as much as they can to a minority of people, consider the vast majority of people who do not kill these crabs and who would rather conserve them.

Regards,

Jonathan Way

89 Ebenezer Road, Osterville MA 02655

Please visit my websites: (1) **Eastern Coyote/Coywolf Research** where you can obtain my books *Suburban Howls*, *My Yellowstone Experience*, *Coywolf*, and others; read my peer-reviewed Publications; and support creating more national parks. (2) **My Yellowstone Experience** which details my experiences viewing the spectacular hydrothermal features, scenery, and wildlife within Yellowstone National Park; and has links to my books within the *Yellowstone Book Series* I have written.

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: horseshoe crab quotas
Date: Wednesday, February 18, 2026 2:45:08 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Emilie Wilder <emilie.is.wilder@gmail.com>
Sent: Wednesday, February 18, 2026 10:01 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>; Marine Fish (FWE) <marine.fish@mass.gov>
Subject: horseshoe crab quotas

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Horseshoe crabs are living treasures in our ecosystems, ancient creatures that we have a duty to protect. Horseshoe crab populations are declining, and now that bait demand is also declining this is the moment to **end the use of horseshoe crabs for bait** and **maintain the existing 200,000 biomedical quota**, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Emilie Wilder
Hudson, Massachusetts

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: horseshoe crabs
Date: Wednesday, February 18, 2026 2:38:30 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

-----Original Message-----
From: Rachel Smolker <rsmolker@gmail.com>
Sent: Wednesday, February 18, 2026 2:37 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: horseshoe crabs

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

I am writing to express my concern with Massachussetts exploitation of horseshoe crabs. Growing up on Long Island, I spent much of my childhood on the shores of long island where these crabs were a welcomed and abundant presence - a keystone species. I never imagined that they would become a commodity, laid claim to for use in medical research and bait. These crabs are not for private sale. They belong to the public and have their own intrinsic value. Massachusetts needs to immediately severely limit and move rapidly to ultimately ban the exploitation of horseshoe crabs.

The ongoing exploitation of this species is unsustainable and unforgivable!

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Public Comment on Horseshoe Crab Quotas
Date: Wednesday, February 18, 2026 2:06:05 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Ann Cilfone <acilfone@comcast.net>
Sent: Wednesday, February 18, 2026 2:00 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Cc: sharl@horseshoecrabs.org
Subject: Public Comment on Horseshoe Crab Quotas

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident who cares deeply about the health of our coastal ecosystems and the humane treatment of wildlife. I am very concerned about the Division of Marine Fisheries' proposal to change horseshoe crab quotas.

Your own proposal notes that bait demand is declining, yet it would allow for expanded biomedical use at a time when horseshoe crab populations have not fully recovered statewide. This feels like the wrong direction. Rather than increasing overall harvest pressure, I urge DMF to end the use of horseshoe crabs for bait and maintain the current 200,000 biomedical quota.

Beyond the ecological impact, I am troubled by the suffering involved. Horseshoe crabs used for bait are captured, handled, and killed in large numbers, and even those used for biomedical purposes undergo stressful bleeding procedures. These are ancient, remarkable animals that play a vital role in coastal food webs, particularly for migratory shorebirds. Expanding harvest at this point does not reflect careful stewardship of a public trust resource.

Management decisions should prioritize conservation, transparency, humane considerations,

and long-term population recovery over short-term industry interests.

Thank you for your time and for considering my comments.

Sincerely,

Ann Cilfone
Edgartown, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe crab limits
Date: Wednesday, February 18, 2026 12:56:55 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Maurice gilmore <maurice.gilmore@comcast.net>
Sent: Wednesday, February 18, 2026 12:46 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Fwd: Horseshoe crab limits

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Sent from my iPhone

Begin forwarded message:

From: Maurice gilmore <maurice.gilmore@comcast.net>
Date: February 18, 2026 at 12:41:29 PM EST
To: dan.mckiernan@mass.gov
Subject: Horseshoe crab limits

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Maurice Gilmore
Newton, MA

Sent from my iPhone

From: Carol Jelinek
To: Marine Fish (FWE)
Subject: Massachusetts" Horseshoe Crabs
Date: Wednesday, February 18, 2026 11:50:28 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

Horseshoe crabs deserve better from Massachusetts. With almost 450 million years behind them, we should be celebrating their resiliency and

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
[Your Name]
[City or Town, MA]

From: Emilie Wilder
To: McKiernan, Dan (FWE); Marine Fish (FWE)
Subject: horseshoe crab quotas
Date: Wednesday, February 18, 2026 10:01:36 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Horseshoe crabs are living treasures in our ecosystems, ancient creatures that we have a duty to protect. Horseshoe crab populations are declining, and now that bait demand is also declining this is the moment to **end the use of horseshoe crabs for bait** and **maintain the existing 200,000 biomedical quota**, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Emilie Wilder
Hudson, Massachusetts

From: Sophia Sayigh
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan
Date: Tuesday, February 17, 2026 8:25:39 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Neighboring states are moving away from horseshoe crab exploitation. New York and Connecticut have taken stronger conservation action. Massachusetts should follow their lead and conserve horseshoe crabs before further declines become irreversible.

Thank you for considering my comments.

Sincerely,
Sophia Sayigh
Brewster, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Comment on Horseshoe Crab Quotas for 2026
Date: Tuesday, February 17, 2026 3:41:26 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Kathleen Dunn <kathleendunn15@gmail.com>
Sent: Tuesday, February 17, 2026 3:36 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Comment on Horseshoe Crab Quotas for 2026

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Kathleen Dunn
15 Williams Avenue

Scituate, MA 02066

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe Crab Policy
Date: Tuesday, February 17, 2026 1:27:47 PM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Victoria Eldridge <victoriaeldridge4@gmail.com>
Sent: Tuesday, February 17, 2026 1:19 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Horseshoe Crab Policy

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Victoria Eldridge
Chatham, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe Crabs
Date: Tuesday, February 17, 2026 11:28:17 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Whitney Tibolt <wtibolt@swwalaw.com>
Sent: Tuesday, February 17, 2026 11:11 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Cc: sharl@horseshoecrabs.org
Subject: Horseshoe Crabs

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Whitney Tibolt
Boston, Massachusetts 02109

Whitney Tibolt
Simonds, Winslow, Willis & Abbott
A Professional Association and Not a Partnership
33 Broad Street, Suite 600
Boston, Massachusetts 02109
T 617.523.5524
F 617.523.4619
wtibolt@swwalaw.com

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe crab take quota
Date: Tuesday, February 17, 2026 10:10:24 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Neil Glickstein <nglickstein48@gmail.com>
Sent: Tuesday, February 17, 2026 9:07 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Horseshoe crab take quota

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Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Neil Glickstein
Gloucester, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Division of Marine Fisheries' proposal to change horseshoe crab quotas.
Date: Tuesday, February 17, 2026 10:08:38 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Heidi Hutton <hutton.heidi@gmail.com>
Sent: Monday, February 16, 2026 3:42 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Cc: sharl@horseshoecrabs.org
Subject: Division of Marine Fisheries' proposal to change horseshoe crab quotas.

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Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a scientist and concerned Massachusetts resident.

Horseshoe crabs are a public trust resource and a keystone species essential to coastal ecosystem function. Their eggs support migratory shorebirds, and their ecological role contributes to fisheries productivity and biodiversity. Population declines therefore have cascading food-web and conservation impacts.

Current management practices undermine recovery. Removal of crabs from spawning beaches prior to reproduction disrupts spawning success, and proposed changes by the Division of Marine Fisheries would increase, rather than reduce, exploitation. These include expansion of biomedical harvest quotas (from 200,000 to 280,000 crabs) and additional routing of bait crabs through the Rent-A-Crab program. Such measures warrant clear justification within a conservation framework.

Given the species' ecological and biomedical importance, continued use as bait in a depleted whelk fishery is difficult to justify. Ending the bait fishery would reduce mortality and support

recovery. Concerns also remain regarding animal welfare impacts of biomedical bleeding practices.

Finally, limited transparency in fisheries data constrains independent evaluation of harvest impacts. Conservation-first management — consistent with actions in neighboring states and enabled by emerging synthetic alternatives — represents a scientifically supportable path forward.

Massachusetts has the opportunity — and responsibility — to align with regional conservation leadership and implement stronger protections now.

Sincerely,

Heidi Hutton

Duxbury MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Massachusetts Must End the Use of Horseshoe Crabs
Date: Tuesday, February 17, 2026 10:07:18 AM

From: Jenn DesAutels <jenn.art@gmail.com>
Sent: Monday, February 16, 2026 2:07 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Massachusetts Must End the Use of Horseshoe Crabs

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Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas. **Massachusetts must end the use of Horseshoe Crabs.**

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that **horseshoe crabs have not fully recovered statewide**, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with **critical ecological value**, and management decisions should prioritize **conservation, transparency, and long-term population recovery**.

Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on **recovery and conservation**.

Horseshoe Crabs Are a Keystone Species— Horseshoe crabs are a keystone species, supporting migratory shorebirds, fisheries productivity, and coastal ecosystem health. Their decline impacts the coastal food web, **harming wildlife and fisheries alike**. Protecting horseshoe crabs directly advances Governor Healey's biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.

Removing Crabs from Spawning Beaches Undermines Reproduction— When a horseshoe crab is removed from a spawning beach before it spawns, there is no guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.

Horseshoe Crabs Belong to the Public— These animals are a public resource, **not a private supply.** Management decisions should prioritize long-term conservation and healthy coastal ecosystems—not expand access for private companies.

Thank you for considering my comments.

Sincerely,
Jennifer DesAutels
Medford, MA

--
Jennifer Cheng DesAutels
she/her/hers
Instructional Designer - STEM Educator - Illustrator
Instagram/Twitter: @chengdesautels
617.233.4121
StudioJCD.com

From: Peter Crawley
To: McKiernan, Dan (FWE)
Cc: sharl@horseshoecrabs.org
Subject: Proposed Revisions to Horseshoe Crab Quotas
Date: Monday, February 16, 2026 6:24:36 PM

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Dear Director Dan McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

More specifically:

1. **Horseshoe Crabs Are a Public Trust Resource—** Horseshoe crabs are a public trust resource, not a private commodity. Management should prioritize the public interest, ecosystem health, and long-term sustainability—not private commercial convenience.
2. **Horseshoe Crabs Are a Keystone Species**— Horseshoe crabs are a keystone species, supporting migratory shorebirds, fisheries productivity, and coastal ecosystem health. Their decline impacts the coastal food web, harming wildlife and fisheries alike. Protecting horseshoe crabs directly advances Governor Healey's biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.
3. **Removing Crabs from Spawning Beaches Undermines Reproduction —** When a horseshoe crab is removed from a spawning beach before it spawns, there is no guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.
4. **Massachusetts Should End the Use of Horseshoe Crabs—** Massachusetts should end the use of horseshoe crabs for bait. Horseshoe crabs are far too ecologically and medically valuable to be killed for a depleted whelk fishery. Ending the bait fishery would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery and conservation.
5. **DMF's Proposal Expands Exploitation Instead of Reducing It—** The proposed management changes convert bait quota into biomedical take through the Rent-A-Crab program. Rather than reducing pressure on horseshoe crabs, this proposal expands exploitation at a time when conservation should be the priority.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Peter Crawley
Plymouth, MA

Peter A. Crawley

The information in this electronic mail is exclusively for the above-named recipient(s) only. It may contain privileged and confidential matters. If you have received this electronic mail in error or if you are not the above-named recipient, please notify the sender immediately by replying to the author's e-mail address. Do not disclose the contents to anyone. Thank you.

From: Paulajean Oneill
To: McKiernan, Dan (FWE)
Subject: horseshoe crabs
Date: Monday, February 16, 2026 6:22:43 PM

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February 16, 2026

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Paulajean O'Neill
218 Great NeckRoad
Wareham, MA 02571
207-838-0584

From: Linda Holland
To: McKiernan, Dan (FWE)
Date: Monday, February 16, 2026 2:21:48 PM

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Mr. Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Horseshoe crabs are not a private commodity. Management should prioritize the public interest, ecosystem health, and long-term sustainability—not private commercial convenience.

Horseshoe crabs are a keystone species, supporting migratory shorebirds, fisheries productivity, and coastal ecosystem health. Their decline impacts the coastal food web, harming wildlife and fisheries alike. Protecting horseshoe crabs directly advances Governor Healey's biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.

When a horseshoe crab is removed from a spawning beach before it spawns, there is no guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.

Neighboring states are moving away from horseshoe crab exploitation. New York and Connecticut have taken stronger conservation action. I am very surprised and disappointed Massachusetts has not. Massachusetts should follow their lead and conserve horseshoe crabs before further declines become irreversible.

Thank you for considering my comments.

Best Regards,

Linda Holland
21 Kingswood Rd.
Auburndale, MA 02466

American Bird Conservancy

Bold action for birds across the Americas

Director Daniel J. McKiernan
Division of Marine Fisheries
marine.fish@mass.gov
March 4, 2026

Re: Proposal on Horseshoe Crab Quota Reallocation

Dear Director McKiernan,

American Bird Conservancy (ABC) appreciates the opportunity to comment on the horseshoe crab quota reallocation proposal put forth by the Division of Marine Fisheries (DMF). The American horseshoe crab needs greater conservation efforts; however, we believe DMF's proposal to reallocate horseshoe crab bait quota to the biomedical sector will not advance this objective. **We are therefore in opposition to the proposal and urge DMF to consider ending the bait harvest entirely—an action that would conserve crabs and benefit other wildlife.**

ABC is a nonprofit organization dedicated to the conservation of wild birds and their habitats across the Americas, including in Massachusetts. We take on the greatest challenges facing birds. The decline in horseshoe crabs and their eggs across the Atlantic Coast poses a threat to shorebirds reliant upon the eggs for their migratory journeys.

One of the shorebirds most impacted by a lack of horseshoe crabs is the rufa Red Knot. This robin-sized bird is a champion long-distance flyer, traveling more than 9,000 miles one way during migration. In 2014, the Red Knot was listed as threatened under the Federal Endangered Species Act. The listing petition, along with the subsequent recovery plan, emphasize how integral horseshoe crab eggs are to the survival of Red Knot. Overharvest of the horseshoe crab in the mid-20th century, including in Massachusetts, fueled declines in the horseshoe crab and Red Knot populations. Along with being federally listed, the Red Knot is listed as threatened under the Massachusetts Endangered Species Act (MESA).

DMF states in the proposal that overall horseshoe crab mortality would be reduced by "about 28,000 crabs annually, assuming a 15% biomedical mortality rate." Following this, DMF says that the estimated bait need for this fishery is "in the range of 75,000 to 90,000 horseshoe crabs annually." These figures are lower than the existing (140,000) or proposed (100,000) bait quotas. DMF recognizes that "Massachusetts routinely approaches fully utilizing its horseshoe crab bait quota…because biomedical demand for these crabs—through the rent-a-crab program—is driving bait harvest." Reassigning the bait quota to biomedical does not offer a real-world reduction in mortality or meaningfully address the underlying conservation needs.

Synthetic alternatives to test the safety of medical therapies exist and can replace the use of the Limulus Amebocyte Lysate (LAL)—which is made from horseshoe crab blood. Last year, the US Pharmacopeia recognized synthetic methods as equivalent, and the US Congress advanced a provision instructing the Food and Drug Administration (FDA) to update its 2012 endotoxin testing guidance to accept synthetic

Contact
abcbirds.org
info@abcbirds.org
tel. **540.253.5780**
fax **540.253.5782**

Address
regular, registered, or certified mail:
P.O. Box 249, The Plains, VA 20198
physical address for deliveries:
8255 E. Main Street, Suites D & E, Marshall, VA 20115

methods. Once the guidance is updated, it could further accelerate adoption of synthetic methods and reduce the need for biomedical harvest.

Given the conservation needs of the Red Knot and horseshoe crab, and the growing use of synthetic methods in medical safety testing, we urge you to forgo this proposal. Instead, we encourage you to act in the interest of conservation by banning the bait harvest of horseshoe crabs.

Thank you for considering our comments and your attention to this issue.

Sincerely,

American Bird Conservancy

From: Carol Amato
To: Marine Fish (FWE)
Subject: Second Zoom meeting re horseshoe crab quotas (public commentary) March 4, 2026
Date: Tuesday, March 3, 2026 4:36:47 PM
Attachments: McKiernan 3-4-26

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On a personal note:

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries 3-3-2026

Dear Director McKiernan,
This is my second letter to you, the other on 2-24-26.
I have been a resident of Cape Cod for over fifty years and the author of several books for children about misunderstood animals and those of special concern. Dr. Carl Schuster
was my mentor for many years, and his wisdom about horseshoe crabs was invaluable to me. In turn, he asked me for feedback from a 'non-scientist's' reading of his not yet published 'The American Horseshoe Crab.' He helped me with his advice to raise an approximately 2 cm horseshoe crab until its 10th year much to the amazement of us both. A male, dying he thought, as it tried to transition to its adult claspers.

Around 1990, I began observing diminishing numbers of horseshoe crabs on beaches that were once teeming with spawning crabs. This continued for several years, prompting me to contact several conservation groups to express concern and letters to Paul Diodati in 2000, then Director of Marine Fisheries in Massachusetts who was polite. I wrote several articles (as an observer) to the Cape Codder and the Cape Cod Times, and the responses expressed observations Cape-wide of diminishing numbers as well. I provided workshops and programs about the horseshoe crab for The New England Aquarium, Atlantic Marine Center, Wellfleet Bay Audubon and Cape Cod classrooms. Yes, I was just an observer…not a scientist nor an official conservationist. But time passed. I researched and studied harvesting trends, joined the numerous HSC conservation groups, did spawning surveys, attended many MDMF meetings. In my own observer opinion, I have been a long time witness to what I believe has been a basic disregard of the DMF for the long-term survival of this ancient species. Others at this second DMF hearing, continuing the HSC Fishery quota update, will outline (yet again and again and again) the essential reasons for disapproving this most recent proposal.

I have written to you a number of times on similar issues concerning horseshoe crab conservation. For years, in fact, as well as attending many hearings and meetings where we both were present along with fishermen, biomedical company representatives, conservation groups and the general public. Evidently, the subject never gets old. Perhaps not old, but in my opinion for so many years no really efficacious measures taken for effective conservation of the horseshoe crab in MA, especially in the Cape Cod area.

Horseshoe crabs are a public trust resource, not a private commodity. DMF's proposal expands exploitation instead of reducing it. The lack of transparency of the so-called 'rule of three' limits public oversight (and has that 'who are you kidding?' aspect. And more. So much more. Observers were right all along.

Thank you for listening,
Carol Amato

From: Carol Amato
To: McKiernan, Dan (FWE)
Subject: DMF Public Hearing re Horseshoe Crab Quotas from Carol A. Amato
Date: Sunday, February 22, 2026 3:31:25 PM
Attachments: Dan McKiernan 2026 .doc

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I will include text of this letter.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries 2-22-2026

Dear Director McKiernan,
I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries'current proposal to change horseshoe crab quotas.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

On a personal note:

I have written to you a number of times on similar issues concerning horseshoe crab conservation. For years, in fact, as well as attending many hearings and meetings where we both were present along with fishermen, biomedical company representatives, conservation groups and the general public. Evidently, the subject never gets old. Perhaps not old but in my opinion and under your DMF leadership, for many years most disappointing measures that do not favor effective conservation for the horseshoe crab in MA, especially in the Cape Cod area.

With your new quotas for harvesting up and coming, I could present so many reasons why this is more of the same disregard for the survival of the species…but you've heard all these opinions before. I will re-emphasize:
DMF's proposal would deliver 80,000 more crabs for bleeding under the biomedical permit. And, Under the rent-a-crab program—unique to Massachusetts—most, if not all, bait-designated crabs would be routed to biomedical companies for bleeding before they are sold for bait adding an additional 100,000 to the biomedical total.

This management decision comes at a time when bait demand is declining due to the collapse of the whelk fishery, and biomedical companies are increasingly transitioning to a synthetic alternative to horseshoe crab blood. Rather than using this moment to reduce pressure and rebuild horseshoe crab populations statewide, DMF's proposal moves in the opposite direction—prioritizing private commercial interests over long-term population recovery, ecosystem health, and resilience.

Mr. McKiernan, really!
What has changed to justify allowing biomedical companies to bleed up to 380,000 horseshoe crabs?

And ultimately, what is driving this decision—science and conservation, or private industry interests?

Whose crabs are these, anyway?

Massachusetts is likely to face increased regional pressure following the passage of legislation in New York ending the use of horseshoe crabs for both bait and biomedical purposes—potentially increasing industry demand toward the Commonwealth. Continued harvesting at these levels undermines long-term population recovery, ecosystem function, and the Commonwealth's public trust responsibilities.

It is time for Massachusetts to join New York and Connecticut in conserving horseshoe crabs rather than intensifying their exploitation.

Thank you for listening.

Carol A. Amato
Boston, MA
and
Brewster, MA

Andrew Gottlieb
Executive Director

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Kris Ramsay

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Marcie Truesdale

March 4, 2026

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries
[submitted via email: marine.fish@mass.gov]

Re: Comments on the Massachusetts Division of Marine Fisheries Draft Horseshoe Crab Quotas for 2026

Dear Director McKiernan,

The Association to Preserve Cape Cod (APCC) writes with strong concern regarding the Division of Marine Fisheries' (DMF) proposal to reduce the 2026 horseshoe crab bait quota from 140,000 to 100,000 horseshoe crabs and increase the biomedical quota from 200,000 to 280,000. We respectfully ask the DMF to reconsider and revise this proposal.

Founded in 1968, APCC is the Cape region's leading nonprofit environmental advocacy and education organization, working for the adoption of laws, policies and programs that protect, preserve and restore Cape Cod's natural resources. APCC focuses our efforts on the protection of groundwater, surface water, and wetland resources, preservation of open space, the promotion of responsible, planned growth and the achievement of an environmental ethic.

Horseshoe crabs are a fascinating and ancient species that play a critical role in coastal ecosystems. Their eggs are a vital food source for local and migratory shorebirds, as well as for many other important marine species. Their unique blood has also been used for endotoxin testing to ensures the safety of medical products and vaccines.

Despite their scientific and ecological importance, horseshoe crab populations have plummeted to dangerously low levels in recent decades due in part to commercial bait harvesting for the whelk and eel fisheries. This decline of the horseshoe crab population has significant consequences for the entire ecosystem, including many commercially important fish and shellfish species. Your own agency has classified the whelk fishery as "depleted and overfished, with overfishing continuing." DMF data also suggests that demand for bait crabs from whelk harvesters is below 100,000 animals per year. Other advantageous bait sources exist, such as the invasive green crab, which are abundant in Massachusetts waters and which have adversely impacted the shellfish industry.

Given that DMF's own quota proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait.

In addition, recognizing that synthetic alternatives to horseshoe crab blood now exist for biomedical use, we recommend that DMF consider decreasing the biomedical quota below the 2025 level of 200,000 and certainly not increase it to 280,000.

The time to wind down the exploitation of horseshoe crabs has come and the DMF proposal is an insufficient response to a complex situation.

On behalf of APCC, thank you for considering these comments and suggestions.

Sincerely,



Andrew Gottlieb
Executive Director

482 Main Street | Dennis, MA 02638
Tel: 508-619-3185 | info@apcc.org | www.apcc.org

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Mass Audubon

Daniel McKiernan, Director
Massachusetts Division of Marine Fisheries (DMF)

March 6, 2026

Via email: **marine.fish@mass.gov**

Re: Horseshoe Crab Quota Reallocation Proposal

Dear Director McKiernan:

Thank you for the opportunity to comment on the proposed horseshoe crab quota reallocation. Mass Audubon **supports** the proposed changes to the DMF regulations for horseshoe crabs. Reallocating a portion of the quota from the bait fishery to the biomedical harvest makes sense as the demand for bait has decreased and this reallocation will result in an incremental reduction in overall mortality for horseshoe crabs. More broadly, Mass Audubon recommends that DMF establish a goal, pursuant to the Biodiversity Initiative under Executive Order 618, for recovery of the population along the Massachusetts coast for the species' important ecological role as a food source for migratory shorebirds. Phasing out both the bait fishery and the biomedical harvest should be planned, though we recognize that this will take time, particularly for the biomedical industry. More information is needed on the proposed 1:2 reallocation from bait to biomedical, given that many companies are already making the transition to synthetics (see pharmascore.org.).

We feel this proposal is a reasonable next step to take following the 2024 decision to close both fisheries for a period in the spring to protect spawning horseshoe crabs. Mass Audubon appreciates the attention and effort that DMF applies to this species, recognizing its significant ecological role. We also appreciate the ongoing partnership with DMF as Mass Audubon coordinates monitoring at many sites and provides data utilized by DMF in tracking population trends.

Horseshoe Crabs' Ecological Role

As you know, horseshoe crabs have important ecological connections to declining and federally protected shorebirds in Massachusetts. Horseshoe crab eggs are a key food source for the Rufa Red Knot, federally and state-listed as a threatened species, as well as other long-distance migratory shorebirds. Massachusetts was historically part of the network of spring stopover sites for Red Knots, with numbers up to 25,000 recorded in eastern Cape Cod Bay in the 19th century, and records showing over 5,000 spring knots as recently as 1953 at Monomoy, all likely feeding on crab eggs.

Even now, over the past few years, shorebird researchers have observed hundreds of Red Knots and thousands of other shorebirds at Monomoy, many feeding on horseshoe crab eggs in sandbars. The hatchling larvae may also provide food for southbound migrating birds into late summer. Improved food sources increase the chances for shorebirds to survive long-distance migration in a condition leading to successful reproduction. We are partnering with others in the region to continue to collect data, so that DMF can make sound science-based policy in the future.

Horseshoe crabs play many other important roles in the ecosystem. Their eggs and hatched larvae provide food for fish, and the adults are eaten by sharks and the federally threatened loggerhead sea

turtle. They prey on polychaete worms and other marine invertebrates, and stir up benthos with their burrowing, providing nutrition for bottom-dwelling organisms, and helping to sustain the benthic food chain.

DMF's monitoring data indicate that the horseshoe crab population in Massachusetts is generally stable or slowly increasing. However, these data need to be considered within the context of historic natural populations, which were evidently orders of magnitude higher. While the historic reports are not in a form that enables rigorous scientific analysis, the historic record is still robust enough to confirm that the current population levels are greatly diminished.

Mass Audubon's Role in Protecting Horseshoe Crabs

For over two decades, Mass Audubon has sought improved management of horseshoe crabs and restoration of the population. In addition to our advocacy efforts, which included rallying public support for the 2024 spawning closure, we support horseshoe crab management by training volunteer monitors and providing DMF with spawning survey data. Through this work, we have developed a deep network of advocates and members who care about the iconic species. Mass Audubon is committed to continuing this work in partnership with DMF and other organizations and individuals.

Planning for a Bright Future for Horseshoe Crabs

While we appreciate this step forward, we urge DMF to continue to work with both fisheries to further minimize impacts to horseshoe crabs. DMF should establish a long-term goal of restoring horseshoe crab populations in Massachusetts to once again achieve healthy spawning densities that support feeding shorebirds up and down Massachusetts coasts.

Protecting and restoring the horseshoe crabs of Massachusetts may indeed be a more significant piece of the puzzle to species recovery of threatened and endangered shorebirds than previously thought. Shorebird populations are rapidly declining in North America, with some species losing more than 90% of their population in the past four decades (Smith et al. 2023, *Ornithological Applications*). Given the recent evidence of Red Knots and other declining bird species feeding on horseshoe crab eggs at Monomoy National Wildlife Refuge, it is important to maintain and increase this food source to increase the chances of successful shorebird migration, survival, and reproduction.

Horseshoe crabs and the ecosystems they support are also struggling with habitat loss, as coastal development, erosion, and sea level rise present increasing threats to beaches, salt marshes, and other coastal habitats. This context is important to consider, in relation to Executive Order 618 and the Massachusetts Biodiversity Goals. Management of this linchpin species should be consistent with those conservation goals.

DMF's Proposal for Quota Reallocation

Mass Audubon's advocacy surrounding horseshoe crabs prioritizes a focus on reducing mortality. DMF's proposed quota reallocation embraces that approach by reducing the allowable catch by nearly 30% for the bait fishery, an industry in which *every* animal that is caught dies. This is why our top near-term priority is phasing out the bait fishery.

The proposed reallocation also decreases the reliance of the biomedical harvest on bait catch. Assuming a mortality rate of 15%, the proposed increase in the biomedical quota of 80,000 will result in the loss of

approximately 12,000 animals, still providing a net gain for the population through the 40,000 animals that will be saved through the bait harvest quota reduction.

We do have questions about the basis for a 1:2 ratio in the reallocation and ask DMF to reconsider whether this is appropriate and necessary. The biomedical industry is beginning to transition to synthetic alternatives to lysate derived from horseshoe crab blood. We would appreciate an opportunity to learn what information supports this increase in demand.

Conclusion

Mass Audubon supports reallocation of horseshoe crab quotas from the bait fishery to the biomedical fishery as a step toward the larger goal of restoring a more robust horseshoe crab population. We look forward to continued dialogue and partnership with DMF staff and leadership as we come together around a shared vision for restoring the horseshoe crab's role in marine and coastal ecosystems. We appreciate the progress demonstrated through this current proposal. We hope it is adopted and that DMF continues to invest in a sustainable future for horseshoe crabs in Massachusetts.

Appreciatively,



E. Heidi Ricci
Director of Policy and Advocacy

Director Dan McKiernan

February 9, 2026

Re: Horseshoe Crab Quota

Thank you for being responsive to those of us who are lobbying for the conservation of horseshoe crabs. We commend you on the recent changes made to the seasonal restrictions on harvest of horseshoe crabs.

I write in opposition to the recent proposal to change quotas. The decrease in bait harvest of 40,000 horseshoe crabs makes sense given the declining whelk fishery. I **oppose** the increase of 80,000 horseshoe crabs for biomedical purposes. This proposed increase promotes the additional use of a public resource for the benefit of private companies. Furthermore, the proposed increase does **nothing to encourage biomedical companies to use the new and approved molecular technologies that replace LAL.** Horseshoe crabs are no longer needed.

Proposing increased total quotas seems premature, given that we don't know if the existing seasonal closures are working to maintain the current horseshoe crab populations. It will take years to find out. As a compromise measure, I would suggest using the 40,000 horseshoe crab bait quota reduction and apportioning 20,000 to each of the two biomedical companies.

-Barbara Brennessel, Ph.D.

Wellfleet, MA

February 27, 2026

Daniel McKiernan, Director
Massachusetts Division of Marine Fisheries

Dear Director McKiernan and Members of the Division of Marine Fisheries,

I am writing to formally oppose the proposed 2026 changes to horseshoe crab quota management. While I appreciate the Division's effort to revisit the bait quota, the overall proposal increases biomedical exploitation and fails to prioritize long term conservation of a public trust species that plays a critical role in Massachusetts coastal ecosystems.

The proposal reduces the bait quota from 140,000 to 100,000 crabs but increases the biomedical quota from 200,000 to 280,000. Under the Rent A Crab program, bait designated crabs may also be routed to biomedical facilities for bleeding prior to being sold for bait. This means that up to 380,000 horseshoe crabs could be bled annually.

This represents a significant expansion of exploitation at a time when bait demand is declining and synthetic biomedical alternatives are increasingly viable. DMF's own proposal acknowledges that annual bait demand approximates 75,000 to 90,000 crabs. Setting a bait quota above actual need, while simultaneously increasing biomedical take, does not reflect precautionary or conservation focused management.

Horseshoe crabs are a public trust resource and a keystone species. Their eggs support migratory shorebirds and contribute to the broader productivity and stability of coastal ecosystems. Removing crabs from spawning beaches disrupts reproduction and undermines population recovery. When a spawning female is taken before she lays eggs, there is no guarantee she will successfully spawn later in the season. These biological realities must guide management decisions.

The biomedical industry has access to a scientifically validated alternative to horseshoe crab blood. Recombinant Factor C, or rFC, is a synthetic reagent used for endotoxin detection in medical products. Numerous peer reviewed studies have demonstrated that rFC is as sensitive and reliable as traditional limulus amebocyte lysate testing derived from horseshoe crab blood. rFC eliminates dependence on wild harvested animals and reduces ecological pressure.

The United States Pharmacopeia has formally recognized synthetic endotoxin testing methods as acceptable alternatives. Major pharmaceutical companies have already begun transitioning portions of their testing to rFC. Continued expansion of biomedical quotas suggests that Massachusetts is accommodating industry inertia rather than encouraging innovation and sustainability.

Voluntary transition is often slow without legislative direction. If Massachusetts is serious about conservation, it should support policies that require or strongly incentivize a shift toward rFC and away from wild harvested horseshoe crabs. Industry adoption will accelerate when there is a clear regulatory signal that reliance on live bleeding is not the long term path forward.

There are also viable alternatives for bait. Research conducted in the Northeast has demonstrated that invasive green crab can be used effectively as bait for whelk. Studies have shown that combinations of green crab and surf clam attract whelk at rates comparable to horseshoe crab bait in controlled trials. Using invasive green crab as bait would reduce pressure on horseshoe crabs while supporting ecological management goals.

At a time when the whelk fishery is struggling and bait demand is declining, this is an opportunity to reduce harvest pressure and invest in alternative bait research and implementation. Instead, the

proposed quota framework maintains or increases overall take.

Neighboring states have taken stronger conservation steps. Massachusetts should not position itself as a refuge for expanded industry extraction in response to regional conservation efforts.

I respectfully urge the Division to reconsider the proposed biomedical quota increase, reevaluate the bait quota in light of actual demand, and prioritize a management framework that advances population recovery, ecosystem health, and transparency. Horseshoe crabs belong to the public. Management decisions should reflect long term ecological stewardship rather than short term commercial accommodation.

Thank you for your time and consideration.

Sincerely,

Joe Castro
Boston & Provincetown, Massachusetts

THE PROGRAM FOR PRESERVING THE NATURAL WORLD, INC.

March 5, 2026

The Massachusetts Division of Marine Fisheries (DMF) proposes raising the biomedical quota of the American horseshoe crab (*Limulus polyphemus*) from 200,000 to 280,000 while, lowering the bait quota from 140,000 to 100,000. Yet, because bait crabs may be bled first under the "rent-a-crab" program, as many as 380,000 could be subject to bleeding, not including crabs transported into Massachusetts from other states.

Few scientists examining the available data would conclude that *L. polyphemus* in Massachusetts is thriving. Surveys cited as evidence of stability began only after populations had already declined sharply from historic levels. A population far below its former abundance cannot reasonably be described as recovered.

Horseshoe crabs play a critical ecological role. Their eggs—and the crabs themselves—are essential food for many species, including migratory shorebirds such as the red knot, federally listed as threatened under the U.S. Endangered Species Act, and the loggerhead sea turtle, also listed as threatened. When horseshoe crab populations decline, species that depend on them decline as well.

Two commercial enterprises threaten horseshoe crab recovery: fisheries using them as bait and biomedical companies bleeding them to produce Limulus amoebocyte lysate (LAL), used to detect bacterial toxins in vaccines and medical devices. While LAL is lifesaving, effective synthetic alternatives now exist and are increasingly used by pharmaceutical companies. Maintaining firm limits on the biomedical harvest would help accelerate the transition while protecting a species already under ecological pressure.

With the strongest commitment to biodiversity conservation in the nation, Massachusetts should honor that commitment by ending the use of horseshoe crabs as bait and maintaining the current biomedical cap during the transition to synthetic alternatives. If we fail to act, we risk contributing to the decline of a species that has survived for more than 400 million years—an avoidable tragedy.

These opinions are mine, and mine alone, and do not necessarily reflect those of anyone connected to The Program for Preserving the Natural World, Inc.

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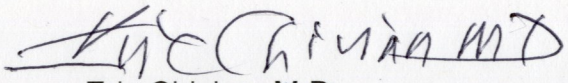
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March 6, 2026

Daniel McKiernan, Director
Massachusetts Division of Marine Fisheries
836 S. Rodney French Blvd.
New Bedford, MA 02744

Submitted via email: marine.fish@mass.gov

Re: Comments on MA DMF's Horseshoe Crab Management Proposal

Conservation Law Foundation appreciates the opportunity to comment on this important issue and your Proposal on Horseshoe Crab Management. [1] In the bait fishery, we support the proposed 40,000 crab decrease in this action but urge MA DMF to work with fishermen on bait alternatives that would allow this fishery to be phased out. We do not support the proposed 80,000 crab increase in the biomedical sector. There are alternatives already in use by Eli Lilly and other pharmaceutical companies, and any increase in quota incentivizes the pharmaceutical industry to delay necessary research that would secure FDA approval of alternatives.

For the long-term health of horseshoe crabs and the marine ecosystem, CLF proposes MA DMF move towards prohibiting harvest for all purposes. Horseshoe crabs are integral to ecosystems in the Commonwealth as part of the food web.[2] Adults and their eggs provide food for migratory birds, such as the red knot and Hudsonian godwit, as well as threatened and endangered species such as endangered loggerhead sea turtles.[3] At least nine valuable commercial fish species, including Winter flounder and swordfish, prey on horseshoe crabs.[4] Horseshoe crabs could play an even larger role in our environment if the population increases and they become a reliable and abundant food source.

Historically, the residents of the Commonwealth used horseshoe crabs in many ways that put pressure on the species including for use as fertilizer, bait for the whelk and eel fisheries, and as a source of Limulus amebocyte lysate (LAL) for the biomedical industry.[5] Local municipalities considered horseshoe crabs to be a threat to certain shellfish (including soft

[1] MA DMF, Public Hearing Proposal on Horseshoe Crab Quota Management, (Dec. 12, 2025) https://www.mass.gov/doc/2026-commercial-hsc-quota-reallocation-proposal/download.
[2] Jordan Krisfalusi-Gannon et al., *The Role of Horseshoe Crabs in the Biomedical Industry and Recent Trends Impacting Species Sustainability*, 5 Frontiers Marine Science (June 4, 2018), (*available at* https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2018.00185/full#F3).
[3] *Id.*; Manomet Center for Conservation Sciences, U.S. Shorebird Conservation Plan 2001, Appendix 2 (May 2001), https://www.shorebirdplan.org/wp-content/uploads/2013/01/USShorebirdPlan2Ed.pdf; NOAA Fisheries, Loggerhead Turtle (May 29, 2025), https://www.fisheries.noaa.gov/species/loggerhead-turtle.
[4] Jordan Krisfalusi-Gannon et al., *The Role of Horseshoe Crabs in the Biomedical Industry and Recent Trends Impacting Species Sustainability*, 5 Frontiers Marine Science (June 4, 2018) (also including sand shrimp, American eel, Atlantic silverside, catfish, devil ray, mullet, northern kingfish, silver perch, summer flounder, striped bass, weakfish, and white perch).
[5] MA DMF News Second Quarter 2006, Responsible Management Strategies Reduce Horseshoe Crab Take in Massachusetts, 8-9, (2006) https://www.mass.gov/doc/dmf-news-2nd-quarter-2006/download.

shelled clams), leading them to set bounties for crabs up until 1970.[6] As a result of the many historical uses, since the 1950s, hundreds of thousands of horseshoe crabs die each year.[7]

In 1997, the Atlantic States Marine Fisheries Commission (ASMFC) began regulating horseshoe crabs following concerns that the species faced over-exploitation, but due to a lack of data they could not establish biological reference points to define when the species is "overfished" or experiencing "overfishing." Those definitions still do not exist today.[8] The ASMFC measures recovery by comparing today's population size to its size in 1998, the first year of management.[9] This means that the index-based reference point for managing recovery centers on a population size determined after decades of removal of hundreds of thousands of crabs each year. Despite this low benchmark, a large share of surveys in the Northeast, 34-65%, indicate that the population is more likely than not still below the 1998 level.[10] Horseshoe crabs have not recovered to the reduced abundance level of 1998, let alone the population size that existed before decades of exploitation.

Horseshoe crabs also face threats to recovery due to climate change. The species is experiencing a loss of spawning and nursery areas due to extreme weather, sea level rise, and coastal development.[11] Climate change will only increase those risks as severe weather events become more frequent and sea level rise accelerates.[12] With threats to horseshoe crabs growing, now is not the time to increase the horseshoe crab harvest quota. Instead, CLF supports MA DMF beginning to phase out the horseshoe crab harvest.

Harvest of Horseshoe Crabs as Bait Should be Phased Out as Soon as Possible

While MA DMF's Notice proposes to reallocate 40,000 crabs from the bait quota such that it would decrease from 140,000 to 100,00, the bait quota is still too large.[13] If MA DMF continues to allow the harvest of horseshoe crabs as bait, CLF urges it to prioritize working with the conch pot fishery to test and facilitate a transition to bait alternatives that eliminates the burden of the bait quota on horseshoe crabs.[14]

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[6] *Id.*; Deborah Rutecki, Ruth Carmichael & Ivan Valiela, *Magnitude of Harvest of Atlantic Horseshoe Crabs, Limilus polphemus, in Pleasant Bay, Massachusetts*, 27 Estuaries 179 (Apr. 2004).
[7] MA DMF News Second Quarter 2006, Responsible Management Strategies Reduce Horseshoe Crab Take in Massachusetts, 8-9, (2006) https://www.mass.gov/doc/dmf-news-2nd-quarter-2006/download.
[8] ASMFC, *2024 Horseshoe Crab Stock Assessment Update*, iv (Apr. 30, 2024), (*available at* https://asmfc.org/wp-content/uploads/2025/01/HorseshoeCrabStockAssessmentUpdate_April2024.pdf).
[9] *Id.*
[10] ASMFC, *Stock Assessment Overview: Horseshoe Crab*, 4 (May 2024), (*available at* https://asmfc.org/wp-content/uploads/2025/01/HSC_UpdateAssessmentOverview2024_rev.pdf).
[11] Mark L Botton et al., Horseshoe Crabs: "Living Fossils" Imperiled in the Anthropocene, Imperiled: The Encyclopedia of Conservation, 3-5 (2021), https://progyanfoundation.org/admin/download/Horseshoe%20Crabs_2021.pdf.
[12] *Id.*; David R. Smith et al., Conservation Status of the American Horseshoe Crab, 27 Reviews in Fish Biology and Fisheries, 135, 155 (2017) https://link.springer.com/article/10.1007/s11160-016-9461-y.
[13] MA DMF, Public Hearing Proposal on Horseshoe Crab Quota Management, (Dec. 12, 2025) https://www.mass.gov/doc/2026-commercial-hsc-quota-reallocation-proposal/download.
[14] MA DMF News Second Quarter 2006, Responsible Management Strategies Reduce Horseshoe Crab Take in Massachusetts, 8–9 (2006), https://www.mass.gov/doc/dmf-news-2nd-quarter-2006/download.

There are more sustainable alternatives to using horseshoe crabs as bait. In Massachusetts, horseshoe crabs are largely used as bait in the conch pot fishery which is already concerning because whelk are "depleted" throughout Massachusetts and "overfished and subject to overfishing" in the Nantucket Sound.[15] It is also unnecessary as studies show whelk find bait mixtures consisting of surf or propeller clams and green crabs are just as or more attractive than mixtures using horseshoe crabs.[16] Green crabs are an especially good bait alternative because they are an invasive species with a detrimental impact on eelgrass, coastal marsh health, and native bivalves.[17] A survey of the whelk fishery in Massachusetts shows that the majority of respondents already use some form of a bait mixture, including mixtures with green crab.[18] However, respondents overwhelmingly still use horseshoe crab in those mixtures, even though studies show it is not necessary.[19]

CLF urges MA DMF to go farther than the proposed decrease in the bait quota and commit to transitioning to bait alternatives that will allow phasing out the use of horseshoe crabs as bait entirely. In the immediate short-term, MA DMF can minimize the burden of the bait harvest by extending spawning protections through July starting this summer. Data shows horseshoe crabs in Massachusetts historically spawn well into July and August.[20] Ending the spawning closure by the beginning of June interferes with the historic spawning period, impeding recovery.

Harvest of Horseshoe Crabs for the Biomedical Sector Should be Phased Out as Soon as Possible

CLF does not support an increase to biomedical quota of 80,000 horseshoe crabs as MA DMF proposes.[21] There is no need to permit—let alone increase—the harvest of horseshoe crabs

[15] MA DMF, Public Hearing Proposal on Horseshoe Crab Quota Management, (Dec. 12, 2025) https://www.mass.gov/doc/2026-commercial-hsc-quota-reallocation-proposal/download; MA DMF, Whelks and Whelk Management, https://www.mass.gov/info-details/whelks-and-whelk-management (last visited Mar. 4, 2026).
[16] Mary Kate Munley et al., *Laboratory Investigations into Alternative Baits for the Channeled Whelk Fishery*, 271 Fisheries Research (Mar. 2024) (*available at* https://www.sciencedirect.com/science/article/pii/S0165783623003132#sec0045); Mary Kate Munley & Megan Molinari, *Evaluating Alternative Bait Ingredients for the Channeled Whelk Fishery*, Sea Grant NH, (on file with NOAA Institutional Repository 48497 DS1).
[17] Mary Kate Munley et al., *Laboratory Investigations into Alternative Baits for the Channeled Whelk Fishery*, 271 Fisheries Research (Mar. 2024); Mary Kate Munley & Megan Molinari, *Evaluating Alternative Bait Ingredients for the Channeled Whelk Fishery*, Sea Grant NH, (on file with NOAA Institutional Repository 48497 DS1).
[18] ASMFC, *Horseshoe Crab Technical Committee Report*, 15 (Oct. 17, 2017).
[19] *Id.*
[20] Carl N. Shuster, Jr, Observations on the Natural History of the American Horseshoe Crab, Limulus polyphemus, Contribution No. 564, Woods Hole Oceanographic Institution (1950); John P. Baptist, R. Smith Osgood & John W. Ropes, Migrations of the horseshoe crab, Limulus polyphemus, in Plum Island Sound, Fisheries Report No. 220, Massachusetts, D.C. U.S. Fish and Wildlife Service, (1957); J.W. Widener & R. B. Barlow, Decline of a horseshoe crab population on Cape Cod, 197 The Biological Bulletin, 300-302 (199); Carmichael, Rutecki & Valiela, Abundance and population structure of the Atlantic horseshoe crab Limulus polyphemus in Pleasant Bay, Cape Cod, 246 Marine Ecology and Progress Series, 225-239 (2003); Sarah Grady & Ivan Valiela, Stage-structured Matrix Modeling and Suggestions for Management of Atlantic Horseshoe Crab, Limulus polyphemus, Populations on Cape Cod, Massachusetts, 29 Estuaries & Coasts, 989 (Aug. 2006).
[21] MA DMF, Public Hearing Proposal on Horseshoe Crab Quota Management, (Dec. 12, 2025) https://www.mass.gov/doc/2026-commercial-hsc-quota-reallocation-proposal/download.

for biomedical use as non-animal derived alternatives can replace reliance on LAL from horseshoe crab blood.

The U.S. Pharmacopeia Microbiology Expert Committee, which includes eight U.S. Food and Drug Administration representatives, authorized non-animal derived reagents for use in endotoxin testing in 2024.[22] Even before that, starting in 2018, the FDA began approving drugs that relied on those alternative endotoxin processes.[23] Alternative endotoxin testing reagents are already in use by several large pharmaceutical businesses including Eli Lilly and Company, which has two Boston-based facilities.[24] Non-animal derived reagents are sufficiently available and reliable such that CLF supports eliminating the biomedical quota for horseshoe crabs to allow the species to recover.

Any quota increase is a step in the wrong direction. MA DMF originally set the cap at 200,000 in 2023 and it is too soon to increase that cap especially based only on demand from the biomedical industry. As Atlantic coastal states ban harvest—which New York has just done—demand will increase on Massachusetts stocks.[25] The biomedical industry already has access to all the bait quota horseshoe crabs through the Rent-a-Crab program, meaning they use well over the 200,000 crabs allotted to biomedical purposes.

MA DMF's proposal to use a new 1:2 reallocation ratio instead of the previously used 1:6 ratio is a step in the right direction, but it is not enough.[26] The ratio is applied when moving crabs from the bait quota, where crabs have 100% mortality rate, to the biomedical quota, where crabs are estimated to have between a 15-30% mortality rate.[27] The proposed ratio attempts to more appropriately incorporate the sublethal effect of bleeding in management decisions; however, the

[22] U.S. Pharmacopeia, Chapter for Endotoxin Testing Using Non-Animal Derived Reagents Published for Early Adoption (Nov. 1, 2024) https://www.usp.org/news/chapter-for-endotoxin-testing-using-non-animal-derived-reagents-published-for-early-adoption, Nicola Reid, The Shift from LAL to Recombinant: What Your Lab Should Expect, Life Science Leader (June 10, 2025) https://www.lifescienceleader.com/doc/the-shift-from-lal-to-recombinant-what-your-lab-should-expect-0001; Fujifilm, USP's Status Regarding the Pyrogen Test and Endotoxin Animal-Free Test Methods (June 9, 2025) https://www.wakopyrostar.com/blog/kit-lal/post/usps-status-regarding-the-pyrogen-test-and-endotoxin-animal-free-test-methods/.

[23] Lonza, FDA Approves First Drug Using the Recombinant Factor C Assey for Endotoxin Testing (Nov. 8, 2018), https://www.lonza.com/news/2018-11-08-14-00; Tom Maloney, Ryan Phelan & Naira Simmons, *Saving the Horseshoe Crab: A Synthetic Alternative to Horseshoe Crab Blood for Endotoxin Detection*, 16 PLOS Biology (Oct. 12, 2018).

[24] Lilly, Sustainability Scorecard for Endotoxin Testing (Spring 2025), https://pharmascore.org/lilly/; Jennifer Tsang, Horseshoe Crabs Break Free from Biomedical Testing (July 29, 2025), https://www.the-scientist.com/horseshoe-crabs-break-free-from-biomedical-testing-73214.

[25] Jordan Krisfalusi-Gannon et al., *The Role of Horseshoe Crabs in the Biomedical Industry and Recent Trends Impacting Species Sustainability*, 5 Frontiers Marine Science (June 4, 2018) (*available at* https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2018.00185/full); NJ Rev Stat § 23:2B-21 (2024); 13-188 C.M.R. ch. 31, § 10; Conn. Acts 23-6 (2023); Nathan Strout, New York Governor Signs Bill to Phase Out Horseshoe Crab Harvesting (Dec. 23, 2025), https://www.seafoodsource.com/news/environment-sustainability/new-york-governor-signs-bill-to-phase-out-horseshoe-crab-harvesting.

[26] MA DMF, Public Hearing Proposal on Horseshoe Crab Quota Management, (Dec. 12, 2025) https://www.mass.gov/doc/2026-commercial-hsc-quota-reallocation-proposal/download.

[27] Rebecca L. Anderson, Winsor H. Watson & Christopher C. Chabot, *Sub-lethal Behavioral and Physiological Effects of the Biomedical Bleeding Process on the American Horseshoe Crab*, 225 U. Chicago Biological Bulletin (July 2, 2014) (*available at* https://pmc.ncbi.nlm.nih.gov/articles/PMC4079546/).

lack of data on the mortality of released crabs makes the reallocation ratio an unreliable tool for management.[28] CLF does not support reallocation of horseshoe crabs to the biomedical quota because reallocation does not appropriately consider the burden of biomedical harvest on horseshoe crab recovery.

To safeguard the long-term health of our marine ecosystem, CLF supports the decrease of 40,000 crabs in the bait fishery, but it does not support the 80,000-crab increase in the biomedical sector. Eventually, we would like to see harvesting phased out. As an important part of our ecosystems, horseshoe crabs sustain critical predator-prey relationships, their eggs provide an irreplaceable food source for threatened migratory birds, and with viable non-animal derived alternatives available for medical testing, there is no longer a justification for exploiting a species that has stabilized our coastal waters for over 450 million years.

Thank you for consideration of our comments.

Respectfully submitted,

/s/ Sarah Shahabi
Sarah Shahabi
Conservation Law Foundation
62 Summer Street
Boston, MA 02110
(617) 372 9289
sshahabi@clf.org

[28] *Id.*; Tom Maloney, Ryan Phelan & Naira Simmons, *Saving the Horseshoe Crab: A Synthetic Alternative to Horseshoe Crab Blood for Endotoxin Detection*, 16 PLOS Biology (Oct. 12, 2018) (*available at* https://pmc.ncbi.nlm.nih.gov/articles/PMC6200278/).

From: Emily Ross
To: Marine Fish (FWE)
Subject: Recapping My comments on the Proposed Horseshoe Crab Catch Limits
Date: Friday, March 6, 2026 4:22:48 PM

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Hi Dan:

I wanted to recap my comments more succinctly from the public comment call the other day.

The State of Massachusetts should be reducing the allowable catch limits for both bait *and* biomedical purposes to move toward an eventual ban like New York State. There is not an infinite supply of horseshoe crabs.

Birds that eat horseshoe crab eggs: Red Knots, Dunlin, Sanderling, Laughing Gulls. Semi-palmated Plovers, Ruddy Turnstones. All of these birds are in decline. We know horseshoe crabs are a critical food source. Even lobsters and other crustaceans eat horseshoe crab eggs. Horseshoe crab eggs are key to whole ecosystems in the ocean. Lobster populations are struggling as well. With climate change, all of the above species are under stress. Thus, making horseshoe crab eggs more plentiful can potentially help these species sustain their numbers.

When there are synthetic solutions available to industry, making LAL from horseshoe crabs more accessible to that industry does not help their Big Pharma's long-term purchasing power. Demand shifts and the companies making synthetic LAL may opt to get out of the business. In fact, the State should want more companies manufacturing synthetic LAL. This is the long-term solution. Having worked in the biopharma industry for many years, I can tell you that pharmaceutical companies can afford to buy synthetic LAL.

Please consider a weaning approach where harvests on the bait and biomedical go down year over year. If NY can do it, I would think MA can do it as well.

Thank you.

Regards,

Emily Ross

857 939-1077

From: Luanne Johnson
To: Marine Fish (FWE)
Subject: comments on proposed horseshoe crab quota changes
Date: Thursday, March 5, 2026 10:03:56 PM

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Dear Director McKiernan,

I am writing to you as a Massachusetts resident and taxpayer opposed to the proposed horseshoe crab quota changes.

I have lived on the island of Martha's Vineyard since the spring of 1992, working as a coastal biologist focused on wildlife research, monitoring, and conservation. One of my first experiences with horseshoe crabs was marveling at the abundant food resource their eggs provided for migratory shorebirds in Katama bay. That same spring I followed a truck from the edge of Katama bay on Chappaquiddick island to the Chappaquiddick ferry and observed 10 different horseshoe crabs falling out of a fisherman's truck bed as he made that trip because he had piled them too high in his truck bed. He showed little regard for these amazing animals and their role in the ecosystem, not even noticing they were falling off of his truck as he drove down the road. He likely thought, as many did and do, that they were an abundant resource that would never disappear. I stopped to pick up those crabs and released those that were salvageable. I later learned these crabs would be ground up to be used as bait for the whelk fishery and that the harvested whelk meat would then be shipped all the way to Asia. Over a hundred thousand crabs were being harvested not to feed people here in Massachusetts but to ship to Asia.

As the whelk fishery is now collapsing, it is surprising that the Division of Marine Fisheries is proposing to permit more horseshoe crab harvest for bait that the fishery needs. In addition, you are proposing to increase the harvest for biomedical use. Nearby states have already banned the take of horseshoe crabs for bait. It is time for Massachusetts to end the bait take too.

I do not support increasing the current biomedical cap either. Maintain it as it is and prioritize ecological recovery. Your management should be grounded in sound science and restoration rather than expanded exploitation of this species.

Thank you for your time and consideration.

Luanne Johnson, PhD.
PO Box 1233
West Tisbury, MA 02575

From: Fionnuala Hart
To: Marine Fish (FWE)
Subject: H. 898: AN ACT TO END THE TAKING OF HORSESHOE CRABS FOR BAIT
Date: Thursday, March 5, 2026 8:57:14 PM

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Dear Director McKiernan,

I am writing in support of bill H. 898: An Act to End the Taking of Horseshoe Crabs for Bait. I am a lifelong nature enthusiast and horseshoe crab fan, and have read numerous books and news articles about the manmade challenges these ancient and critically important animals face. The combined toll of habitat loss, bait take, and exploitation by the pharmaceutical industry impacts not just horseshoe crabs, but all of the other species that rely on them. This bill will help to address the pressures that horseshoe crabs face and would be an important first step towards prioritizing ecological recovery.

Sincerely,
Fionnuala Gerrity
69 White St.
Belmont, MA
02478

From: Bill Vickstrom
To: Marine Fish (FWE)
Subject: Horseshoe Crab Comments - Attn: Director McKiernan -
Date: Thursday, March 5, 2026 4:55:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan
Director, Massachusetts Division of Marine Fisheries
Dear Director McKiernan,
I am writing as a concerned Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change crab quotas. Horseshoe crabs were once an abundant resource in Massachusetts waters. Sadly until recently, they have been a very poorly managed resource, with numbers severely declining. I attended the recent zoom meeting that requested public comments. Listed below are my thoughts:
I am deeply against your proposal to actually increase harvest totals when the resource is in very early stages of minimal recovery. I was shocked to learn that only 1% of our state's horseshoe crab population exists north of Cape Cod. They were once a very plentiful resource here and bounties were actually offered to remove them. As a conversationalist, I have always believed in conservation first, before harvesting of a resource is allowed. A sensible and moral plan for any resource should always take this approach! It is my sincere hope that fishermen have a sustainable fishery with proper conservation guidelines and by taking corrective action for resources that have been depleted.
New York and Connecticut have already taken the progressive approach to ban horseshoe crab harvesting. With Massachusetts also being a progressive state, we should follow their lead and preserve this ancient resource that been such an important part of our ecology. With the whelk fishery declining and other bait alternatives, bait harvesting should be phased out. There are humane synthetic biomedical alternatives to replace the cruel blood draining approach now being used. I find it very hard to believe that only a 15% mortality rate occurs for a crab drained of 1/3 it its blood.
I have been to Monomoy Wildlife Refuge and Morris Island numerous times and seen what a thriving eco-system looks like with their presence. It is my sincere hope that horseshoe crabs can rebound if give a proper chance in other parts of Massachusetts. They have existed for an estimated 450 million years, making them a living fossil.
Sincerely,
Bill Vickstrom
Friends of Myles Standish State Forest
Wildlands Trust
SEMPBA

From: Kaufman, Leslie
To: David; Marine Fish (FWE)
Cc: Chris Powicki; Judith Weis; Emery, Hollie E (EEA); crbrookline
Subject: Re: Comment on Last Night"s Massa. Division of Fisheries Management Public Hearing on Proposed Regulations
Date: Thursday, March 5, 2026 2:40:46 PM

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Thank you David those are good comments.

We need to reimagine the fishery to fit these times, and recognize the varied services provided by what we sometimes regard as stocks or independent bank accounts. These are actually highly dynamic and interdependent as are the species and interactions that give rise to them. This is inconsistent with the concept of maximum sustainable yield unless "yield" includes all values- both those that derive from dead fishes, and those that derive from live fishes. The "live" is still taken for granted as simply what is out there prior to its deading. There is little thought about the *minimum level of a species for ecosystem sustainability,* or the overall demand profiles put out there by both the market and non-market economies.

Les

Les Kaufman
Professor of Biology
Boston University
lesk@bu.edu
- Marine Program
- Pardee Center for the Study of the Longer-Range Future
- Institute for Global Sustainability

From: David <ddow420@comcast.net>
Sent: Thursday, March 5, 2026 11:10 AM
To: marine.fish@mass.gov <marine.fish@mass.gov>
Cc: David Dow <ddow420@comcast.net>; Chris Powicki <chrisp@weeinfo.com>; Kaufman, Leslie <lesk@bu.edu>; Judith Weis <jweis@newark.rutgers.edu>; hollie.e.emery@mass.gov <hollie.e.emery@mass.gov>; Clint Richmond <crbrookline@aol.com>
Subject: Comment on Last Night's Massa. Division of Fisheries Management Public Hearing on Proposed Regulations

Dear Director Dan McKierran

I didn’t have the time to comment on the horseshoe crab proposal to reduce the commercial catch quota

and increase the medical catch for this iconic species which has been in the ocean, since the dinosaurs
walked on land. On Cape Cod and the Islands, we have lost our working water front to tourism and other non-marine activities, so that the commercial whelk fishery utilizing horseshoe crab bait has less economic contribution to our economy than tourists/residents who celebrate female horseshoe crab
breeding on our beaches.

Extreme weather events (blizzards; tornadoes and hurricanes) are more
common which leads to beach erosion and more sand bars offshore or beach expansion elsewhere (Seee recent Association for the Preservation of Cape Cod Newsletter piece by Andrew Gottlieb). During a recent drive along Surf Drive in Falmouth following the recent blizzard, I observed a diminished beach and dredge out in the ocean removing sand in the channel. This is bound to effect the Essential Fish Habitat for horseshoe crabs which is not being considered by the Massa. Division of Marine Fisheries. When I participated in the "Productive Capacity of Wetlands" project in Louisiana,
oil/gas drilling increased saltmarsh erosion from canals which diminished offshore shrimp production.
Coastal eelgrass beds and onshore saltmarshes/sand dunes on Cape Cod help reduce beach erosion.

Discharge of treated sewage effluent in coastal water (3 million gallons per day for Falmouth) will increase
nutrients (nitrogen and phosphorus); toxic chemicals (PFAS, heavy metals and microplastics) and microbes
which could Impact horseshoe crabs and other commercial fish and shellfish populations. Thus Massa. DMF
should adapt an adaptive, ecosystems-based fisheries management approach (see 2021 comments from
Sierra Club to Massa. Coastal Zone Management for revision of Massachusetts Ocean Management Plan).
The MOMP 2026 revision process appears to leave the effects of climate change on finfish and shellfish
up to the Massa. Division of Marine Fisheries. The MOMP revision webinar included numerous elected
officials from Cape Cod and Islands where the horseshoe crab fishery is conducted. MOMP and the Coastal Biodiversity initiative should be integrated into the Massa. DMF management process.

When I earned my Ph.D. in Zoology from the University of Georgia in 1971, I studied under Gene Odum
(Ecosystem Ecologist) and Larry Pomeroy (Biological Oceanographer), who emphasized looking at the big
picture in converting science into government policies/regulations. I retired from NOAA Fisheries Northeast
Fisheries Science Center- Woods Hole Laboratory in 2009 and was quite disappointed that the presentations
in last nights public hearing didn't exhibit shifts made in recent years (climate change effects by Mid-Atlantic
Fishery Management Council; ecological economics estimates on values of natural capital and ecosystem
Services; Environmental Justice and Diversity/Equity/Inclusion constituent challenges; increasing biodiversity and ecosystem services restoration; environmental stressors from human economic exploitation
in the ocean and creating a sustainable economy as human populations increase). Hopefully the

Massa.
Executive Officer of Energy & Environment; courts and state legislature will rectify these short comings at
Ma. DMF that damage our progressive reputation. The west coast states back up their rhetoric with action
on the ground.

Yours truly,

Dr, David Dow
Falmouth, Ma. 02540

From:	David
To:	Marine Fish (FWE)
Cc:	David Dow; Chris Powicki; Leslie S. Kaufman; Judith Weis; Emery, Hollie E (EEA); crbrookline
Subject:	Comment on Last Night"s Massa. Division of Fisheries Management Public Hearing on Proposed Regulations
Date:	Thursday, March 5, 2026 11:11:09 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director Dan McKierran

I didn't have the time to comment on the horseshoe crab proposal to reduce the commercial catch quota
and increase the medical catch for this iconic species which has been in the ocean, since the dinosaurs
walked on land. On Cape Cod and the Islands, we have lost our working water front to tourism and other non-marine activities, so that the commercial whelk fishery utilizing horseshoe crab bait has less economic contribution to our economy than tourists/residents who celebrate female horseshoe crab
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Executive Officer of Energy & Environment; courts and state legislature will rectify these short comings at
Ma. DMF that damage our progressive reputation. The west coast states back up their rhetoric with action
on the ground.

Yours truly,

Dr, David Dow
Falmouth, Ma. 02540

From: John Winslow
To: Marine Fish (FWE)
Subject: Attn Director Daniel McKiernan, Public Comment re: Horseshoe Crabs
Date: Wednesday, March 4, 2026 9:56:00 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Director McKiernan,

I would like to submit a comment in support of the proposal to decrease the bait harvest quota by 40,000 and increase the biomedical harvest quota by 80,000.

I intentionally refer to the biomedical quota as a **harvest**, because that is the most scientifically accurate description. These animals are removed from the ocean, handled, and subjected to bleeding procedures that cause significant physiological stress. Your department has stated that approximately **one in six animals dies as a result of this process**. While five of six are returned to the water, they do not return unchanged. Many experience reduced survival and diminished ability to function normally for an extended period of time. So while I don't support raising the amount of harvesting any horseshoe crabs at this time, shifting the harvest to save 28,000 horseshoe crabs is better than nothing.

Despite the public comments from well-intentioned fishermen, the scientific consensus is clear: **Red Knots depend heavily on horseshoe crab eggs**. During their migration from South America along the eastern seaboard, these birds concentrate in areas where horseshoe crab spawning occurs because they must rapidly accumulate fat reserves. Without sufficient food, many birds fail to complete their migration or arrive on their breeding grounds in poor condition, which can prevent successful reproduction. This has direct and serious consequences for the long-term health of the species.

I understand that it may feel outside the traditional scope of a Division of Marine Fisheries to consider the needs of migratory shorebirds. However, managing a resource like horseshoe crabs cannot be done in isolation. Horseshoe crabs occupy a critical role in a broader ecological system. Tens of thousands of migratory birds rely on the timing and abundance of their spawning events. Effective fisheries management therefore requires an **ecosystem-level perspective**, not a single-species approach.

It is also important to acknowledge the economic structure of this fishery. Virtually every horseshoe crab harvested for bait is first bled by LAL manufacturers. In practice, the entire horseshoe crab fishery functions as a supply chain supporting companies such as ACC and Charles River. Much of the revenue fishermen receive is ultimately tied to the biomedical industry rather than to the bait market itself. This dynamic helps explain why there is currently a surplus of bait crabs that have already been captured and bled.

There are also clear **economic benefits to increasing the number of spawning horseshoe crabs**.

First, larger spawning populations support healthier populations of migratory shorebirds such as Red Knots. These birds attract thousands of birdwatchers, photographers, and naturalists each year who travel to coastal areas specifically to witness the migration. Bird tourism generates significant economic activity for local communities through lodging, restaurants,

guiding services, and related tourism.

Second, horseshoe crab spawning events themselves have become a major wildlife attraction. People travel to coastal areas specifically to observe these ancient animals coming ashore in large numbers. A larger spawning population increases the reliability and scale of this spectacle, creating additional opportunities for educational programs, guided experiences, and coastal tourism.

Third, increasing the spawning population contributes to the overall health of the coastal ecosystem. Horseshoe crabs play an important role in supporting biodiversity, and a healthy ecosystem benefits many marine species that regional fisheries depend on. Protecting this biodiversity helps maintain the productivity and stability of coastal waters, which ultimately supports the long-term success of commercial and recreational fisheries.

For these reasons, the decision before you is not simply about allocating crabs between bait and biomedical uses. It is also about the broader ecological and economic consequences of harvest levels and the responsibility to manage this resource in a way that supports the health of the entire ecosystem, including the migratory shorebirds that depend on horseshoe crab spawning.

Thank you for your time and consideration.

John Winslow

Resident of Falmouth, MA

From: Conner Eldridge
To: Marine Fish (FWE)
Subject: Horseshoe crab
Date: Wednesday, March 4, 2026 6:30:27 AM

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Please stop over harvesting the horseshoe crab. They are actual dinosaurs who have managed to live millions of years and humans are about to end that. Please take care of the wildlife thank you
Sent from my iPhone

From: Nakul Vyas
To: Marine Fish (FWE)
Subject: Horseshoe Crabs
Date: Tuesday, March 3, 2026 10:58:33 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Director Dan McKiernan,

I am a resident of Brighton, Massachusetts and a medical student at Boston University. I am writing regarding the Division of Marine Fisheries' plans for horseshoe crab quotas.

I have seen the majestic horseshoe crab only once in person while visiting Martha's Vineyard in the summer. Horseshoe crabs are sentient creatures that can feel pain. Their blood is not needed for biomedical purposes because there is a synthetic alternative, recombinant Factor C (rFC). Please end the use of horseshoe crabs for both bait and biomedical uses. In my view, zero horseshoe crabs should be harmed for either of these purposes.

Horseshoe crabs are ancient, predating dinosaurs. However, their numbers have fallen precipitously. Since horseshoe crabs are keystone organisms, their declining numbers are felt throughout Massachusetts's ecosystem. New York, New Jersey, and Connecticut have banned or substantially restricted horseshoe crab harvests. Please guard Massachusetts rich biodiversity and natural splendour for future generations and choose kindness by ending the killing and bleeding of horseshoe crabs.

Best regards,
Nakul Vyas

From: Cole Dobratz
To: Marine Fish (FWE)
Cc: jakeangeloseafoods@gmail.com
Subject: Horseshoe Crab Opposing letter for March 6, 2026
Date: Tuesday, March 3, 2026 8:07:28 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Good Evening,

My name is Cole Dobratz and I am a twenty one year old full time commercial fisherman from Old Lyme, Connecticut. Growing up here, I was blessed to have spent many childhood years learning the industry from both my grandfather, and father, making myself a proud third generation waterman. If I wasn't helping commercially, you would have likely found younger me running around our local beaches, docks, and marshes. As a result of this upbringing, I developed an understanding and appreciation for our delicately balanced ecosystem.

Within the past few years, I have watched the state of Connecticut take away the commercial horseshoe crab industry without a fight. Having owned just one of 12 standing HSC licenses prior to the ban on harvesting, us few fishermen simply had no chance. Although we did not have a voice against much larger environmentalist groups boasting thousands of members, I believe Massachusetts' watermen have the chance to prove what we could not; That the horseshoe crabs populations along the east coast are more plentiful than ever.

If these harvesting reductions are passed, I believe the fisherman will never again see this quota returned. In Connecticut, we first saw lunar closures and catch reductions. In just a few years, it was shut down completely. Today, fishermen are now fighting a ban to make using horsecarbs or their eggs for bait completely illegal in our state. We are dealing with a death from 1,000 cuts, that I believe could financially ruin my lifelong dream and passion. If this ban occurs in my and your state, I will no longer be able to afford to catch conch and eels, and therefore my business will likely not succeed.

I hope that you will consider the viewpoints and data displayed by your fisherman to draw the best conclusions before going forward with any drastic measures. Take it from your neighbor, who has seen the cascading effects of regulation in just a few short years.

Best,
Cole Dobratz

From:	Kim Grant
To:	Marine Fish (FWE)
Subject:	Attention: Director Dan McKiernan, Public Comment Commercial and Recreational Fishing Limits
Date:	Tuesday, March 3, 2026 4:38:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

As a MA resident, I remember going to Horse Neck Beach in the 1970s and seeing hundreds of horseshoe crabs. Now, I'm lucky if I see one. Please significantly reduce the harvest quotas like other states have. Let the population recover back to its norm.

I'm reading that bait demand is declining due to the collapse of the whelk fishery, and pharmaceutical companies are increasingly transitioning to a synthetic alternative to horseshoe crab blood as highlighted by The Boston Globe (Feb. 10, 2026), Massachusetts wants to bleed more horseshoe crabs. What if there was a better way. " Massachusetts is moving backward."" Synthetic alternatives exist, bait demand is declining, and conservation-first management is achievable—if Massachusetts chooses to lead rather than lag behind." It's horrible that they pierce their hearts, drain their blood and put them back in the ocean. I've seen documentation that there is a 30% mortality rate but it is speculated that the mortality rate is higher since some of them that are put back in the ocean still do not survive.

Horseshoe crabs have been around Massachusetts for millions of years. Let's keep this iconic species around for millions more.

Thank you.

Best,

Kim Grant
Sandwich, MA

From: JUDY ASARKOF
To: Marine Fish (FWE)
Subject: Please choose to protect horseshoe crabs instead of decimating their population further!
Date: Tuesday, March 3, 2026 8:09:43 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello! My name is Judy Asarkof. As a Mass resident, I am asking you to PLEASE end the bait take, maintain or even decrease the taking of horseshoe crabs for biomedical use, and PLEASE prioritize their recovery. Human use has decimated the populations and frankly, that is very concerning.

I remember as a kid seeing so many in the Cape Cod Bay area!!! and around Massachusetts seeing all the horseshoe crabs leading their lives. It is horrendous that I see so few these days! It is time to stop our use and abuse of sensitive species and horseshoe crabs need to recover!

Thank you!

Judy Asarkof
Carlisle MA with experience all over Cape Cod

From: Sarah Cierpich Yates
To: Marine Fish (FWE)
Subject: Public comment regarding horseshoe crab regulations
Date: Tuesday, March 3, 2026 7:52:55 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Dan McKiernan and colleagues,

As a former fisheries biologist for NOAA with a scientific publication on horseshoe crab research, I support the total phasing out of horseshoe crabs being harvested for bait and eventually for bleeding, as well, in MA. I write to you as a private citizen, since I was illegally fired from my career of 19 years by some kid named Big Balls who worked for trillionaire Musk's DOGE for a hot minute last year.

It sounds like there is a compromise happening with the bait and biomedical harvest. I would support eliminating the bait harvest entirely and using bled crabs doubly to satisfy the bait demand, while eventually bait usage of HSCs is phased out as well. There are plenty of synthetic and alternate baits to use. We don't need to remove more HSCs than absolutely "necessary".

Horseshoe crabs are an ancient species that requires laying eggs on land to reproduce. These eggs are an essential part of the diet of migratory birds each year, including the threatened Red Knot. HSCs are an essential part of the coastal ecosystem, and we must not only protect their population from overharvest but also their breeding grounds from overdevelopment and other ruin - changes in temperature and currents, light pollution, fertilizer and sewage runoff, over sand recreational driving, and more.

Anything that can be done to preserve the natural world as untouched and unharvested as possible, I highly support. Yes, our tech billionaire overlords may have the ocean boiling in 20 years, but it's still worth pushing back against kakistocracy and oligarchy and trying to save our planet.

Thanks for your consideration and for what you do. SC

From: Rachel Bramson
To: Marine Fish (FWE)
Subject: Horseshoe crab exploitation
Date: Tuesday, March 3, 2026 7:07:34 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Please prohibit access to bleeding and killing this precious natural resource, horseshoe crabs.

Let industry use the synthetic blood and find a way to make it cheaper. Necessity is the mother of invention.

As you allow destruction of our horseshoe crabs, our birds are dying out. You are destroying the natural balance of life for the greed of the biomedical and pharmaceutical industry.

Prohibit monetization of our wildlife through destruction. Invest in eco tourism instead.

Rachel Bramson MD
49 Pheasant Run
Wellfleet MA
02667

From: saearle@aol.com
To: Marine Fish (FWE)
Subject: Full protection for Horseshoe Crabs
Date: Tuesday, March 3, 2026 6:51:43 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Who owns horseshoe crabs? These remarkable animals with 400 million years of history are ancient icons worthy of full protection.

Killing horseshoe crabs for profit by a few that incurs loss for the great majority of people and all of nature is simply wrong.

The evidence is clear. The trade in ocean wildlife is based on 20th century habits that have caused collapse of natural systems vital to the health of the planet including humankind. This is simply wrong.

Yielding to commercial interests, whether from fishing enterprises that profit from taking wildlife at no cost or the pharmeceutical industry with less costly synthetic alternatives available, is simply wrong,

The allowable take must be zero for creatures that are vital links in ancient ecosystems that stretch from the Arctic to Antarctica.

Why set meaningless quotas that are impossible to enforce. Just stop killing them for commerce, period.

.

I urge immediate full protection now for horseshoe crabs while recovery for these treasured animals is still possible.

It is the right thing to do,

Sincerely,

Sylvia A. Earle
Oceanographer
Former Chief Scientist, National Oceanic and Atmospheric Agency
National Geographic Explorer at Large
Founder Mission Blue
Ocean Elder
Library of Congress Living Legend
Time Magazine First Hero for the Planet

From: Heidi Aylward
To: Marine Fish (FWE)
Subject: Public Comment Supporting the End of Horseshoe Crab Bait Harvest
Date: Tuesday, March 3, 2026 4:10:36 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

To:
Marine.Fish@mass.gov
Subject: Public Comment Supporting the End of Horseshoe Crab Bait Harvest

Dear Director McKiernan and the Division of Marine Fisheries,

I am writing as a concerned local resident of MA to ask you to end the commercial horseshoe crab bait harvest in Massachusetts. I can not be at the public hearing, so submit this comment in my stead.

I've lived here a long time, and I've seen a sad and noticeable decline in the number of horseshoe crabs present on the beaches across the Cape and the South Shore. They just aren't here like they used to be.

My concern also comes from personal experience. As a teenager working in a crab lab, I saw the blood extraction process firsthand. At the time, I didn't realize I was working for the biomedical industry. It stayed with me. Knowing that these animals are also being killed just to be used as bait—especially when HorseshoeCrabs.org notes they take over 10 years to even reach maturity—feels like a waste of a species that has been around for millions of years.

The decline of an ancient animal is a signal that should set of dashboard alarms. We should be protecting these crabs so they can continue to support our local ecosystem, including sharks and shorebirds. Please stop the bait take to give our local populations a chance to recover.

Thank you,

Heidi Aylward
Summer_Skies@msn.com

From: ken shwartz
To: Marine Fish (FWE)
Subject: Horseshoe crab harvesting regulations
Date: Monday, March 2, 2026 9:48:14 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Please do the only smart thing….until/if you are SURE the quotas will allow for maintaining the current population/biomass , error on the side of lower allowable harvesting. No matter the demand for whatever use , its foolish to do anything but error on the side of caution.

Sent from IPhone Shwartzken@gmail.com

From: victoria milne
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Monday, March 2, 2026 6:55:17 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Horseshoe crabs are iconic, ending up as the subject of sculpture, paintings, jewelry. They're beloved and over harvested. Where I live, the fishing industry insists there is no over harvesting, but they've said that about every challenge, ie it's not the fishermen who are to blame. Similarly, I believe they're over harvested for the biomedical industry who have little to lose by taking all they can get with the hermit crabs considered a small price to pay for their purpose, but little oversight to how they're handled.
Please end the unnecessary and unsustainable bait harvest of these creatures that are vulnerable to.
Thank you.
Victoria Milne
South Yarmouth, MA
02664

From: anita bapooji ryan
To: Marine Fish (FWE)
Subject: Horseshoe Crabs - Attention: Director McKiernan
Date: Monday, March 2, 2026 1:48:42 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Mr. McKiernan -

My name is Anita Ryan and I live in Hingham, MA.

My family and I have been delighted every time we see a horseshoe crab in Hingham harbor or along the Weymouth Back River in Bare Cove Park. This is a resilient yet fragile species. We urge you to protect and preserve this species for future generations.
To protect them, we need to protect their eggs and their blood and encourage companies to find synthetic alternatives that don't look upon this treasured species as a commodity.

We need good management of this species to ensure its continued survival in the coastal waters of New England.

I urge that we limit the horseshoe crab bait industry and DO NOT expand the blood-letting industry. We need to do this for this crucial and ancient animal, and let better baits and newer medical models prevail, as will happen this year in New York's newly passed legislation. This is a step we must take today to ensure that our children and grandchildren live in a future world with wonderful thriving species and biodiversity like the Horseshoe crab.

Thank you!

Anita

37 Baker Hill Drive, Hingham MA 02043

A letter to the Massachusetts Division of Marine Fisheries — at marine.fish@mass.gov (Attention: Director McKiernan) — would go a long way to help migrating shorebirds and horseshoe crabs. The ask: stop blood-letting as well as baiting. This is also a good week to reach out to Governor Healey, Representative Kassner, and Senator Tarr.

From: Pamela Russell
To: Marine Fish (FWE)
Subject: saving the horseshoe crab
Date: Monday, March 2, 2026 1:06:54 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

To whom it may concern:

The horseshoe crab is a vital part of our ecosystem. Like so many other species, harvesting it is unethical. We need to honor Mother Nature's plan and understand that every species has an important role in the sustenance of the whole creation of life!

For any particular species to be considered expendable for another part of the system is a serious misunderstanding of the entire biological system that was created by a force larger than we humans can comprehend.

However, we must! We must taken in the miraculous creation of all life. We must comprehend the interdependence of all life and the necessity of respecting and honoring ALL life including the horsechose crab!

Lastly it is gross to consider that profit is more important than life. It is not. It is human folly to think so. It is reprehensible that humans destroy life for their own greedy economic profit.

Respectfully submitted,
Pamela Russell
127 Bradstreete Crossing,
Plymouth, MA 02360

[T]he invitation of mindfulness is to drop into the actuality of experience, opening to this moment just as it is, with things exactly as they are, and then, to whatever degree possible, seeing if you can be at home with what is unfolding. In all likelihood, you will discover that your equanimity and nonreactivity are very limited, that you're going to react virtually

instantly with all sorts of thoughts, emotions, contractions in the body, with impatience, with aversion.

You might think, “Why am I meditating? I’m sure this isn’t what I’m supposed to be feeling.” Yet this is exactly what you’re supposed to be feeling. Why? Because the curriculum here is that you are staying open to feeling and recognizing whatever it is you are actually feeling. No matter how painful or disturbing it is, for at least a moment, seeing if you can hold it in awareness as a parent might hold a child, with pure love. That moment of awareness is a moment of liberation. It’s not like you have to sit for fifty years to taste moments of liberation. But it helps if you come to see life itself as the practice, and every moment as a gift.

-Jon Kabat-Zinn, founder of Mindfulness Based Stress Reduction (MBSR) and a student of Zen Master Seung Sahn of the Kwan Um School. From an interview in Lion's Roar, March 31,2025.

From:	David
To:	Marine Fish (FWE)
Cc:	David Dow; Emery, Hollie E (EEA); Leslie S. Kaufman; Judith Weis; Chris Powicki
Subject:	Comments on Massa. Division of Marine Fisheries Horseshoe Crab Fishery Management Plan
Date:	Monday, March 2, 2026 11:34:03 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director Dan McKierran:

I am Dr. David Dow, a retired marine scientist from NOAA's Northeast Fisheries Science Center-Woods Hole Laboratory and emeritus Sierra Club activist (who helped co-found the Sierra Club Cape Cod Group). I feel that the focus of the Fishery Management Plan should be ecological restoration of the horseshoe crabs and protection of their essential fish breeding habitats on coastal beaches. The bait fishery should be eliminated and the the medical catch and release fishery should be reduced to allow for catching release death rates.

I was the last NOAA Recreational Fisheries Coordinator in the Northeast and developed Essential Fish Habitat reports for some Federally managed species. I feel that the Massachusetts Ocean Management Plan and coastal Biodiversity Plan should be utilized to protect horseshoe crabs in the ocean from climate change/nutrient pollution and restore their coastal beach breeding areas on Cape Cod and elsewhere in the Commonwealth. We already face challenges in becoming Cape No Cod and I would hate to see iconic horseshoe crabs follow this pathway.

Having recently participated in a recent meeting for revision of the Massa. Ocean Management Plan (MOMP) and participated in the Biodiversity Plan dialog on Cape Cod, I feel that 3 mile ocean boundary with Federal waters and shoreline beach breeding areas which are subject to erosion from storms/sea sevel rise are not being adequately addressed by the Massa. Executive Office of Energy and Environment from an adaptive, ecosystem-based management perspective. The Sierra Club submitted an outline of this perspective in 2021 to MOMP which was ignored. Ma. DMF should operate under the revised MOMP guidelines and the state Clean Energy and Climate Action Plan for effects on fish/ shellfish populations (not just fishing and natural mortality effects on recruitment and growth).

Thanks for considering these comments.

Dr. David D. Dow
Falmouth, Maa.

From: Nicole Rivard
To: Marine Fish (FWE)
Subject: Friends of Animals opposes MA DMF"s horseshoe crab proposals
Date: Sunday, March 1, 2026 10:28:12 PM

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Mass. Division of Marine Fisheries

March 1, 2026 Written Testimony

OPPOSING DMF's PROPOSAL TO:

- **Reduce the bait quota from 140,000 to 100,000 horseshoe crabs**
- **Increase the biomedical quota from 200,000 to 280,000.**

Under Massachusetts' Rent-A-Crab program, biomedical companies would also be permitted to bleed up to 100,000 bait-designated crabs before they are used as bait.

Submitted by Friends of Animals/Presented by Nicole Rivard, Government Relations Manager

It is appalling that DMF is offering Massachusetts residents this bait and switch scheme.

On behalf of Friends of Animals and our hundreds of Massachusetts members, we oppose the agency's audacity to intensify the exploitation of horseshoe crabs. Currently headquartered in CT, we led the efforts here to ban the killing of horseshoe crabs for bait or biomedical purposes—it passed in 2023. We also helped get similar legislation passed in the NY State Legislature, which was signed into law by Gov. Hochul in December.

These efforts to save horseshoe crabs from extinction may not have as big of an impact if they're still being killed in places like Massachusetts.

We do support the legislation—H. 898—that is moving through the Massachusetts legislature, which would ban the killing of horseshoe crabs for bait. It got voted out of the Joint Committee on Environment and Natural Resources and is awaiting a vote in the House. If it passes it will go to the Senate.

Fishers in Massachusetts are allowed to kill and chop up 140,000 horseshoe crabs each year for use as bait for whelk? The unnecessary, reckless practice is done so people could eat conch fritters and severely hinders the species' ability to recover.

In 2024, Massachusetts Division of Marine Fisheries issued 185 Horseshoe Crab Bait permits. The agency's data reveals that 40 fishers participated in 2024, earning a total $280,000, which means they're pushing horseshoe crabs to extinction to earn $7,000.

Massachusetts must stop myopically protecting the commercial fishing industry by allowing the reckless, unnecessary killing of any horseshoe crabs for bait so people could eat smoked eel and conch fritters.

Not to mention it's unnecessary, and frankly insane, that Massachusetts would increase the

biomedical quota. May 1 marked a pivotal shift in the biomedical industry that changes the tide for imperiled Atlantic horseshoe crabs. U.S. pharmaceutical companies are now allowed to use animal-free alternatives—the reagents rFC and rCR— in tests to detect toxic substances in injectable medicines and implants rather than the blue blood of the horseshoe crab.

Now the biomedical industry has no excuse not to stop wasting the lives of horseshoe crabs. The new standard was proposed and adopted by U.S. Pharmacopeia.

No one should be debating whether their numbers are plentiful enough to allow their commercial slaughter in the first place—it's always been scientifically and morally unjustifiable.

Dwindling numbers of horseshoe crabs along Connecticut and New York shorelines have led to their functional extinction in Long Island Sound. That means they have become too rare to fulfill their crucial, interconnected role in the ecosystem. This tragedy is unfolding in Massachusetts as well.

The low numbers of horseshoe crabs are leading to a steep decline and possible extinction of other species—such as the threatened red knot— a shorebird who depends on horseshoe crab eggs for food to fuel its epic biannual flights between the southern tip of South America and the Arctic.

In 2021, fewer than 7,000 red knots were found in the Delaware Bay, **a key spring stopover habitat**. That's less than a third found in 2020. **And red knot numbers remained at historically low levels in 2022.**

Without sufficient horseshoe crab eggs to feed on, migratory birds run out of energy and die before reaching their breeding grounds. Horseshoe crabs are also an important source of food for other wildlife such as sea turtles, and species such as anemones, barnacles, oysters, and seaweed use horseshoe crab shells as homes.

Brand new research from the Maritime Aquarium (https://www.maritimeaquarium.org/newsroom/posts/new-studies-urge-immediate-coordinated-action-for-the-protection-of-horseshoe-crabs)

in Connecticut reveals horseshoe crab populations have plummeted to "severe" levels. Immediate action is needed to prevent horseshoe crabs from going extinct, the authors say, adding that the New England area has been understudied and under protected.

The study gave researchers a comprehensive look at horseshoe crab trends not just in the Long Island Sound's offshore waters, but also in its 115 bays, harbors and coves.

Atlantic horseshoe crabs are in such dire straits that Friends of Animals and other advocacy groups have petitioned to list them under the Endangered Species Act.

Horseshoe crabs have figured out how to harmonize with the environment to last half a billion years. They deserve our respect and protection.

From: Dante Simonetta
To: Marine Fish (FWE)
Subject: Attention: Director McKiernan, Horseshoe Crab Input
Date: Sunday, March 1, 2026 5:54:08 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the proposed changes to the horseshoe crab quotas for 2026.

Since moving to the United States, I've fallen in love with the coastal wildlife here. Horseshoe crabs in particular have become incredibly meaningful to me. There's something grounding about seeing a species that has existed for hundreds of millions of years still making its way onto our beaches. They feel like part of the identity of this place.

Over the past few seasons, I've spent time watching them spawn. What I've noticed has been hard to ignore. Horseshoe crabs used to mate in pairs, but now it's common to see multiple males stacked onto a single female. That change feels significant. It suggests imbalance. When crabs are removed from spawning beaches before they lay eggs, there is no guarantee they will successfully reproduce later. Disrupting that process works against recovery.

That's why I'm deeply concerned about the proposal to increase the biomedical quota from 200,000 to 280,000 crabs, especially when up to 100,000 bait crabs may also be routed through the Rent A Crab program for bleeding. At the same time, the Division has acknowledged that bait demand is closer to 75,000 to 90,000 crabs annually. Expanding total take in this context feels unnecessary and out of step with the moment we are in.

Neighboring states are choosing a different path. New York has passed a three year moratorium on commercial horseshoe crab harvest for both bait and biomedical purposes. Connecticut has also taken stronger conservation measures. Massachusetts has the opportunity to lead here, not lag behind.

I understand that biomedical companies rely on horseshoe crab blood, but synthetic alternatives exist and are increasingly being used. Bait demand is declining. We could also shift more fully toward alternative bait sources such as green crabs. This seems like a moment to reduce pressure and allow populations to rebuild, not expand harvest.

Horseshoe crabs are not just a commodity. They are part of a fragile coastal ecosystem and a public resource that belongs to all of us. I respectfully urge the Division to maintain the existing 200,000 biomedical cap and reconsider the scale of the bait quota rather than increasing overall exploitation.

Thank you for taking the time to consider public input on this important issue.

Dante Simonetta, Provincetown MA.

From: Mass Audubon on behalf of Maria Vasington
To: Marine Fish (FWE)
Subject: Support Stronger Horseshoe Crab Protections
Date: Sunday, March 1, 2026 4:30:24 PM

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Mar 1, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Thank you for your time!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Ms. Maria Vasington
23 Oak St
Cambridge, MA 02139
(516) 242-9809
mvasington11@gmail.com

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe Crab Conservation
Date: Sunday, March 1, 2026 9:45:39 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Petitpas, Christian (FWE) <christian.petitpas@mass.gov>
Sent: Friday, February 27, 2026 6:17 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>; Glenn, Robert (FWE) <robert.glenn@mass.gov>; Perry, Derek (FWE) <derek.perry@mass.gov>; Pugh, Tracy (FWE) <tracy.pugh@mass.gov>
Subject: FW: Horseshoe Crab Conservation

I'm assuming several of us got this.

_____
Christian M. Petitpas, Ph.D. (she/her/hers)
Shellfish Sanitation and Management Program
Massachusetts Division of Marine Fisheries
706 South Rodney French Boulevard
New Bedford, MA 02744

Ph: (508) 742-9766
christian.petitpas@mass.gov
Join the conversation! We're on Twitter, Flickr, Facebook, and YouTube.

From: Mark Hibberd <markghibberd@gmail.com>
Sent: Thursday, February 26, 2026 3:27 PM
To: Petitpas, Christian (FWE) <christian.petitpas@mass.gov>
Subject: Horseshoe Crab Conservation

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26 February 2026

Dear Dr. Petitpas,

Massachusetts Division of Marine Fisheries
Dear Director McKiernan,
Horseshoe crab eggs are a crucial resource for global migratory birds, and rare shorebirds including the Red Knot have been seen feeding on them at Monomoy, where horseshoe crab harvest is forbidden. Shorebirds are among the most rapidly declining group of birds, while I have enjoyed observing them for many years, in Massachusetts and other regions along their epic global migratory journeys. It would be devastating to think that we would not act to maintain the ability of residents of Massachusetts to enjoy these and several other shore bird species.
While the new proposed rule is a step in the right direction and therefore urgently needed as the migration will soon begin again, I urge you to also consider banning their harvest for any purpose until numbers are restored and stable. At such a point the active monitoring and management of the horseshoe population might allow limited harvest for legitimate purposes where alternatives are not available. Harvests for biomedical research are no longer valid as synthetic blood products are now widely available.
Many thanks for taking the immediate necessary action to protect the horseshoe crab and all those other species that depend upon it, and on behalf of those who love nature and birds.

Sincerely,
Mark Hibberd MD PhD

10 Hudson Road
Lexington, MA 02421
markghibberd@gmail.com

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: horseshoe crab quotas for 2026
Date: Sunday, March 1, 2026 9:43:52 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Judy Belaval <notophthalmus@snet.net>
Sent: Friday, February 27, 2026 7:34 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: horseshoe crab quotas for 2026

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

I am concerned that this year's DMF proposed horseshoe crab quotas **expands biomedical exploitation; maintains bait quotas that exceed actual need; puts Massachusetts out of step with neighboring states; and ignores unresolved concerns about population recovery.**

The proposed quotas prioritize private commercial interests over long-term population recovery, ecosystem health, and resilience.

Please propose quotas that reduce horseshoe crab exploitation and promote long term population recovery.

Thank you,
Judy Belaval

Jamaica Plain, MA

From: Frank Mand
To: Marine Fish (FWE)
Subject: Horseshoe Crab regulation hearing commentary
Date: Saturday, February 28, 2026 9:29:31 AM

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Director McKiernan:

Why are we here?

Why, when there is agreement in the scientific community – outside the State House - that the present Massachusetts regulations governing the harvest for horseshoe crabs are outdated and ineffective, are we debating another half-measure?

A bill to end all taking of horseshoe crabs for bait – in Massachusetts – House Bill 898, is presently under consideration by the Massachusetts legislature.

Testimony in support of that bill, was submitted by many important conservation organizations, marine biologists and scientists, including a Nobel Laureate.

Just three months ago Mass Audubon's director of Legislative and Government Affairs, Sam Anderson, offered a wonderfully succinct argument for the immediate and complete halt to the bait harvest.

The message is clear, Anderson wrote: "Ending the horseshoe crab bait harvest will not harm the biomedical industry." The state's Division of Marine Fisheries," he continued, "is already working with biomedical companies to secure a supply of crabs separate from the bait fishery. Meanwhile the industry is transitioning to synthetic endotoxin testing, which eliminates the need for horseshoe crab blood.

"Both biomedical horseshoe crab bleeding firms in Massachusetts already sell their own synthetic versions of the test," Anderson noted.

The bait harvest, Anderson concluded, is outdated, unnecessary and deeply unpopular.

It's too late for the state to show leadership in this area, but can we at least follow the examples of Delaware, New Jersey, New York and Connecticut?

To quote famous Boston Celtic announcer, Johnny Most, "stop fiddling and diddling." End the bait take!

Frank Mand, Vice President, Southeastern Massachusetts Pine Barrens Alliance

From: Salvatore Insogna
To: Marine Fish (FWE)
Subject: Regs on horseshoe crab 'harvesting
Date: Saturday, February 28, 2026 8:39:20 AM

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Dear Director McKiernan,

Horseshoe crabs are vital to the survival of many species, including threatened and endangered bird species. The overall " take" of horseshoe crabs needs to be substantially decreased. There are well recognized alternatives to the use of horseshoe crab blood for biomedical purpose.

Please lower the "take" of horseshoe crabs in the new regulations.

Thank you,

Sal Insogna
Massachusetts resident

Sent from my iPhone

From: John H
To: Marine Fish (FWE)
Subject: Please STOP the taking of Hors shoe crabs
Date: Friday, February 27, 2026 3:38:34 PM

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For bait or Medical uses.

John Hutchinson

Chatham, Ma

From:	Holmquist, Kara L.
To:	Marine Fish (FWE)
Subject:	MSPCA Opposition to Proposed Increase in Biomedical Horseshoe Crab Quota
Date:	Friday, February 27, 2026 11:27:57 AM
Attachments:	image002.png image003.png image004.png

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

The Massachusetts Society for the Prevention of Cruelty to Animals (MSPCA) urges rejection of the proposed increase in the biomedical harvest quota for horseshoe crabs.

As you know, the horseshoe crab populations faces significant pressure from biomedical and commercial harvesting, and the process used to produce Limulus amebocyte lysate (LAL) by bleeding causes both mortality and sublethal impacts. There are approved non-animal alternatives, such as recombinant Factor C (rFC) and recombinant Cascade Reagents (rCR).

Horseshoe crabs are a keystone species; their eggs feed migratory shorebirds and support coastal ecosystems. Increasing the quota would further strain this already declining species and the coastal environment. The availability of non-animal alternatives eliminates any need to expand the harvest.

We request the Division to reject the proposed quota increase and prioritize conservation.

Thank you,
Kara Holmquist

****

Kara Holmquist
Director of Advocacy
Massachusetts Society for the Prevention of Cruelty to Animals (MSPCA)
350 South Huntington Avenue, Boston, MA 02130
617-541-5008
Pronouns: she/her/hers

mspca
Kindness and Care for Animals®

The MSPCA's mission is to protect animals, relieve their suffering, advance their health and welfare, prevent cruelty, and work for a just and compassionate society

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Watch our video: See how we advocate for animals every day!

From: Mass Audubon on behalf of Charles Byrd
To: Marine Fish (FWE)
Subject: Support for DMF"s horseshoe crab proposal
Date: Friday, February 27, 2026 9:56:49 AM

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Feb 27, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Both as a veterinarian and a Massachusetts resident, I am deeply concerned about preserving our coastal resources, if not restoring them to pre-exploitation states. The importance of horseshoe crabs and their spawning cycles in the ecosystem has been long overlooked and abused by short-sighted anthropocentric policies. It is critical that the DMF adopt these changes if there is any hope of preserving the horseshoe crab population for the future, either as a resource for exploitation or as a step toward restoration of natural habitat.

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Dr. Charles Byrd
644 Bee Hill Rd
Williamstown, MA 01267
(773) 595-5079
byrdcp@gmail.com

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Urge you to reduce Horseshoe Crab quotas
Date: Friday, February 27, 2026 9:56:43 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Ginger Ryan <gingerryan11@gmail.com>
Sent: Friday, February 27, 2026 9:54 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Urge you to reduce Horseshoe Crab quotas

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Dear Director McKiernan,

I am writing to urge you to limit the bait and biomedical quotas for horseshoe crabs. The current proposal increasing those quotas are unnecessary.

This proposal puts Massachusetts out of step with neighboring states; and ignores concerns about population recovery.

The DMF's own proposal states that "the current local bait crab demand approximates 75,000-90,000 horseshoe crabs annually" — an explicit acknowledgment that the proposed bait quota exceeds actual bait

Bait demand is declining due to the collapse of the whelk fishery, and biomedical companies are increasingly transitioning to a synthetic alternative to horseshoe crab blood.

The DMF should be instead reducing quotas and focusing on rebuilding horseshoe crabs populations in the state. Our survival as a species depends on our ecosystem health.

As elder citizens, we are deeply concerned about preserving biodiversity for a healthy, sustainable, livable future for all.

Respectfully,

Ginger Ryan and Peter Kelsey

35 Crescent Street, Cambridge, MA

From: lynn atkins
To: Marine Fish (FWE)
Subject: Horseshoe crab limits - citizen comment
Date: Thursday, February 26, 2026 8:45:50 PM

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Dear Daniel McKiernan,

Regarding:
"6. Commercial Horseshoe Crab Quotas (322 CMR 6.34). In response to changing demand for horseshoe crabs, DMF proposes to: a. Reduce the annual horseshoe crab bait quota by 40,000 crabs thereby moving it from 140,000 crabs to 100,000 crabs. b. Reallocate these 40,000 crabs to the biomedical quota at a 1:2 ratio thereby increasing the annual biomedical quota from 200,000 crabs to 280,000 crabs."

I agree with reducing the bait catch quota of horseshoe crabs.

I disagree with increasing the biomedical research quota.

To fight against 'shifting-baseline-syndrome', I would ask:
Are the horseshoe crabs at pre-European contact levels?
If not we should reduce all take until the populations have rebounded to the levels they were before the1600s.

As I'm sure you are aware, horseshoe crabs play a critical role in the ecosystem. There are endangered migratory shorebirds and a myriad of other animals that rely on horseshoe crab eggs for essential, basic sustenance. Their ecological contributions need to be THE primary and protected value we assign to them.

Thanks for the opportunity to comment.

-Lynn Atkins
350 High Street
Pembroke, MA 02359

From:	Braxton Rivera
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date:	Thursday, February 26, 2026 2:15:59 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Considering that the DMF's own data highlights a shrinking market for bait alongside an increasing reliance on horseshoe crabs for biomedical needs, and noting that populations have yet to achieve a full statewide recovery, now is the ideal time to phase out the bait harvest entirely while capping the biomedical quota at its current 200,000 limit to prevent further escalation of harvest pressure.

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Braxton Rivera
Provincetown, MA

From: L Heald
To: Marine Fish (FWE)
Subject: Horseshoe Crab
Date: Thursday, February 26, 2026 2:10:36 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention Dan McKiernan, Director, MA Division of Marine Fisheries,

Dear Director McKiernan,

I live in West Falmouth. As a child, I recall the beaches filled with horseshoe crab carcasses. If we found one alive on its back, we would rush it to the ocean. It is a rare day indeed when I even see a dead one.

It is clear to me that their numbers have drastically declined. **These ancient members of the sea need policies that allow their numbers to increase especially since the discovery that they are needed for medical purposes. Please use your Department's powers to stop the use of Horseshoe crabs for BAIT.**

As a rule, I believe Massachusetts leads the states in protecting species in decline or in jeopardy of extinction. Will your office continue this leadership?

Sincerely,

Linda Heald
51 View Creast Dr
Falmouth, MA 02540

From: mailagent@thesoftedge.com on behalf of Lynnb@psych.umass.edu
To: Marine Fish (FWE)
Subject: Please Do Not Increase Biomedical Horseshoe Crab Quota
Date: Thursday, February 26, 2026 1:04:17 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan:

I urge the Division of Marine Fisheries not to enact its proposed increase to the biomedical harvest quota for horseshoe crabs in 322 CMR 6.34. Please consider following through with the proposed reduction in bait quota but also maintaining--if not reducing--the current biomedical harvest quota in light of scientific advancements that allow for bacterial endotoxin testing without harming horseshoe crabs. A synthetic, animal-free alternative using recombinant factor C (rFC) reagents has been available commercially since 2004, and was recently officially endorsed by the US Pharmacopeia, which sets federal quality standards for pharmaceuticals. Some major biomedical companies, such as Eli Lilly and GSK, have already made substantial progress in implementing synthetic alternatives for their endotoxin testing, while others are at varying points in the transition. To increase the biomedical harvest quota now would be to de-incentivize the transition to humane alternatives.

Your office can prevent more horseshoe crabs from being captured from the wild, piled inside plastic bins, and hauled into labs, where they are strapped to a stand and drained of nearly a third of their blood. With both pharmaceutical regulators and the biomedical industry moving toward synthetic alternatives, it's time to decrease--not increase--the number of crabs subjected to this inhumane process. I hope that the Division of Marine Fisheries will become an agent of change for the better by ensuring that more horseshoe crabs are left in the ocean and out of laboratories.

Sincerely,

Lynn Bengston
37 North St
Belchertown , MA 01007

From: Mass Audubon on behalf of Coco Gamsey-Boudier
To: Marine Fish (FWE)
Subject: MY BEST FRIEND IS A HORSESHOE CRAB!!!!
Date: Thursday, February 26, 2026 12:55:21 PM

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Feb 26, 2026

Director Daniel McKiernan

Dear Director McKiernan,

I write in support of DMF's proposal to reduce the annual bait harvest quota for horseshoe crabs and increase the allowed biomedical harvest, which will have the effect of reducing the number of horseshoe crabs killed.

Overall, the proposal could save 28,000 horseshoe crabs annually, which is a step toward putting the population back on track for a recovery. But given the ecological, cultural, and economic importance of horseshoe crabs, the outdated and unnecessary harvest of these animals to be used as bait in an unsustainable conch fishery needs to be phased out completely.

Protecting horseshoe crabs is really important because they are the best thing ever!!!

Please proceed with adopting these changes in the harvesting regulations, and pursue further steps toward recovery of this species to historic population levels.

Sincerely,

Miss Coco Gamsey-Boudier
60 Newcomb Heights
Wellfleet, MA 02667
(774) 801-8843
cgamseyboudier@charlemont.org

From: robart1120
To: Marine Fish (FWE)
Subject: To whom it may concern ; In defense of the horseshoe crab hopefully enter in your consciousness of this endangered species. Please save the horseshoe crab for future generations (Your grandchildren "s children) and all the migrating birds .Let"s sup...
Date: Wednesday, February 25, 2026 2:01:23 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Sent from my Verizon, Samsung Galaxy Tablet

From: Barbara Reed
To: Marine Fish (FWE)
Subject: Horshshoe Crabs
Date: Wednesday, February 25, 2026 10:55:50 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

PLEASE SAVE THE CRABS!!!
THEY ARE VERY IMPORTANT!!

From: Janeen Cox
To: Marine Fish (FWE); roberta1cox
Subject: Attention Director McKiernan
Date: Tuesday, February 24, 2026 7:00:47 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Robert & Janeen Cox
67 Overlook Dr.
Holliston, MA 01746

Daniel McKiernan
Massachusetts Division of Marine Fisheries
dan.mckiernan@mass.gov

To Director McKiernan,

We are reaching out as tax paying residents and supporters of Mass Marine Fisheries. As lifelong residents of Mass, we both share a passion for all things Massachusetts but especially the ocean. We grew up enjoying our coast, the Atlantic Ocean, and the beautiful complex ecosystems that are supported by the ocean. Searching for sea dollars, sea worms, building drip sandcastles, digging for clams, and fishing for stripers is such a glorious way to grow-up. We are also now proud to say our love for the ocean has only strengthened throughout the years. We now own a boat (gone are the days of fighting for prime Canal fishing spots) and frequently fish from it and, on occasion, we ice fish-not from the boat of course though! Additionally, we have contributed to science by gathering data on stripers and on breeding horseshoe crabs. We proudly donate to the DMF with Striper Coalition and Atlantic White Shark license plates as well as very proudly pay for fishing licenses.

Because of this love and passion for all things ocean, we also take laws and conservation seriously. We want our children and any future grandchildren to be able to enjoy what we got to as children and now as adults. However, things are changing-some good, some bad. Plovers are making a comeback, but the Bay of Maine is one of the fastest warming bodies of water on Earth, and the fate of Right Whales seems bleak. So, it is reasons like our concern that have us writing to you today. We are very concerned about the DMF's 2026 proposal to set new horseshoe crab quotas. Our concern is growing as more New England States strengthen their protections of horseshoe crabs. Proposed quotas exceed actual need and puts us out of step with our neighbors. Furthermore, Massachusetts "rent-a-crab" program is antiquated and unique to only us. This is not fair or right to us as residents. We do not need entities from other states, with no vested interest in to Mass come into our state and impact our ecosystems, these living ancient dinosaurs in a detrimental way. We've gotten so much wrong and failed to protect so many species-from Cod to Right Whales and everything in between.

Please, it is time we join New York and Connecticut and conserve (not intensify exploitation) these amazing creatures-these living fossils for Massachusetts residents and all future residents!

Thank you, Janeen & Rob Cox

Janeen Cox
(she/her/hers)

From: Sheila Filipowski
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Monday, February 23, 2026 1:18:05 PM

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It is imperative to protect horseshoe crabs as a living connection to the past, for the purpose of advancing knowledge of life on this planet.

Please find alternative sources of bait to help our fisher people and preserve our ability to carry out important research.

Sheila Filipowski
Eastham, MA

Get Outlook for iOS

From: The Cook Family
To: Marine Fish (FWE)
Subject: Re: Horseshoe Crab quotas - please do not change them!
Date: Monday, February 23, 2026 12:00:25 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

Please please please let the horseshoe crab population fully recover before you increase the biomedical quota and please consider ending the use of these amazing crabs for bait.

Thank you for considering my comments as a Massachusetts taxpayer.

Sincerely,
Katharine O. Cook
Osterville, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: attention Dan McKiernan - proposed horseshoe crab quotas
Date: Monday, February 23, 2026 9:33:43 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Robert Buchsbaum <rnbuchsbaum@gmail.com>
Sent: Sunday, February 22, 2026 2:24 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: attention Dan McKiernan - proposed horseshoe crab quotas

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Commissioner McKiernan,

I am writing as a resident of Beverly, Massachusetts in opposition to the proposal to increase the annual take of horseshoe crabs for the biomedical industry from 200,000 to 280,000. Synthetic alternatives for testing for endotoxins in medical transplant devices and injected medicines have recently been approved for use by US Pharmacopeia which sets the standards for the industry. Instead of an increase, there should be a reduction in the quota for biomedical take. This would stimulate the increased use of synthetics and would also prevent pressure from out of state harvesters from coming to Massachusetts, since New York has banned all harvesting and other eastern states have taken similar measures. Given the availability of synthetic alternatives, there is ultimately no reason to continue to harvest horseshoe crabs for their blood.

The horseshoe crabs is a fascinating marine organism that has existed on earth almost unchanged for around 400 million years. All the evidence is that horseshoe crabs in Massachusetts are currently at low numbers compared to historic levels over 50 years ago. Their decline has likely been a factor in the decline in migratory shorebirds (sandpipers and plovers) which visit our coastline in the spring and fall and depend on

the eggs horseshoe crabs deposit at the edge of the sea in spring to fuel their migrations to their northern breeding grounds. The current allowable take of horseshoe crabs per year for bait for the conch (whelk) and eel fisheries is the single greatest source of human induced mortality, but there is still some mortality associated with bleeding.

While reducing the take for the bait industry from 140,000 to 100,000 is a step in the right direction, it will have no measurable impact on the population of horseshoe crabs since it is still above the levels that are typically harvested each year.

I am currently retired as a Coastal Ecologist with Mass Audubon where I worked for over 30 years along the Massachusetts coast. Thank you for your consideration,

Robert Buchsbaum, Ph.D.
12 Bertram Street
Beverly, MA 01915
978-473-2389
rnbuchsbaum@gmail.com

From: gthomasryan@verizon.net
To: Marine Fish (FWE)
Subject: for Director McKiernan
Date: Sunday, February 22, 2026 8:14:09 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director

I understand that your Division of Marine Fisheries is proposing changes in horseshoe crab quotas.

I'm a voter in Eastham MA, and, from an early age, have learned a deep respect for these prehistoric creatures and how imporant they are to the ecosystem.

Please do not have them used as bait.
Please put limits on those killed for biomedical purposes, focusing more on methods that may draw their blood but then return them to the ocean unharmed.

Thank you for the work you oversee on so many important levels. Please respect and let these crabs thrive!

Sincerely

G. Thomas Ryan
Eastham MA

From: Stephanie Ellis
To: Marine Fish (FWE)
Subject: Comment on horseshoe crab proposal
Date: Sunday, February 22, 2026 11:12:22 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

My name is Stephanie Ellis. I am the Director of Wild Care, a wildlife rehabilitation hospital located on Cape Cod.

I am writing as an Orleans, MA resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Horseshoe crab populations have not fully recovered statewide. We recommend discontinuing the use of horseshoe crabs for bait and maintaining the existing 200,000 biomedical quota, rather than expanding the overall harvest pressure.

Having worked in this field for 25 years, I have witnessed the decline of several migratory shorebirds such as the Red Knot, Ruddy Turnstone and Sanderling. These declines are well-researched and directly linked to the depletion of Horseshoe Crabs and their eggs, which serve as an imperative food source for these species during their long-distance spring migration from South America to their Arctic feeding grounds.

Horseshoe crabs are a public trust resource with critical ecological value.

Management decisions should prioritize conservation, and long-term population recovery.

Thank you for considering my comments.
Stephanie

Stephanie Ellis
Executive Director
Wild Care, Inc.
10 Smith Lane
Eastham, MA 02642

www.wildcarecapecod.org

Find us on Facebook!

508-240-2255 office





From: goldie.g.freeman
To: Marine Fish (FWE)
Subject: Against horseshoe crab quotas
Date: Sunday, February 22, 2026 11:08:05 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

I am writing as an older biologist who has volunteered on horseshoe crab surveys and talking to the public about the keystone species and the artificial LAL use.

It is VERY disappointing to see the proposal to increase use of the animals' blood when the 2 MA companies have hidden real population impacts of this unnecessary procedure. The profits of these 2 companies are outweighing the science.

Eli Lilly saw the promise early and started the switch. Ethics matter. Fisheries needs to stop this step backward when other states like NY are phasing out natural LAL harvesting and bait use by 2029!

Sincerely,
G. Freeman

Sent from my Galaxy

From: Elizabeth Perkins
To: Marine Fish (FWE)
Subject: Attn: Dan McKiernan
Date: Sunday, February 22, 2026 6:46:19 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing in regards to the issue of horseshoe crabs being used as both bait and for medical research. As a 73 year old resident of Chatham, MA I have noticed over the years a continual decline in many of the creatures that were prevalent here in my childhood, from scallops to horseshoe crabs to hermit crabs. The shoreline is a wasteland compared to what it used to be. This is alarming.

Please help preserve our natural world which was in balance before human activities threw it off. There is a way for humans to continue to thrive while not also continuing to kill off the very environment we need.

Please do not expand the harvest pressure on horseshoe crabs by increasing the biomedical quotas, and please reduce the bait quotas even further.

Thank you for considering my thoughts.
Sincerely,
Liz Perkins, 23 Atwood Lane, Chatham, MA 02633

--
Elizabeth F. Perkins
tel. 412-708-2437

From: blamviola@verizon.net
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Saturday, February 21, 2026 7:36:45 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Director McKierman-

There is no logical reason to raise the limits on Horseshoe crab harvest!
They are already higher than current demand.

If anything they should be lowered to be in line with our nearby coastal states.
As with other fishing quotas, they should be set lower to ensure population stability.

Please reconsider the harvest limits.
Barb Lambdin
Cape Cod, MA

From: david.bohn@comcast.net
To: Marine Fish (FWE)
Subject: Comment on proposed horseshoe crab quota changes
Date: Saturday, February 21, 2026 7:15:09 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

February 21, 2026

Daniel McKiernan

Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

I am writing as a Massachusetts resident - and as a seasonal Cape Cod resident who cares about the natural environment. I wish to offer my comments on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Honestly, I am surprised by the proposed changes. Your agency acknowledges there is declining demand for the use of horseshoe crabs as bait – yet you are proposing to expand the total number of horseshoe crabs that can be used for biomedical purposes. Horseshoe crab populations across Massachusetts remain strained and frankly, the proposal to increase the total number of these creatures that may be taken seems extremely shortsighted.

My position is simple: **This is an appropriate moment to end the use of horseshoe crabs for bait completely. I urge the Division to maintain the existing 200,000 biomedical quota and not increase the overall number of horseshoe crabs that may be taken.** Doing so would represent a thoughtful, conservative approach - knowing and recognizing the value they provide to the medical world. There are many other available bait options. Keeping the current biomedical quota and eliminating their use for bait will reduce overall pressure on the horseshoe crab population.

Horseshoe crabs are a public trust resource with critical ecological value, and your Division's management decisions should prioritize conservation and long-term population recovery.

Thank you for considering my comments. I hope that your agency will make a smart and thoughtful decision on this matter.

Very truly yours,

David A. Bohn, P.E.

12 Baldwin Drive

Sharon, MA 02067

Cape Cod address:

27 Nichols RD

East Falmouth, MA 02536

david.bohn@comcast.net

(617) 571-1778 < mobile

From: Deathwraith Deathwraith
To: Marine Fish (FWE)
Date: Saturday, February 21, 2026 5:56:28 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Arthur Mirkin Eastham Ma would like to Thank You for Your time&urge You to reconsider the horshshoe crab decision & postpone it for 2026 until You have more credible intelligence to act on.If we play God,&we get it wrong,we really play Death. Look at the state of Trout in the last 100yrs.Do You have a backup plan to farm raise horshshoe crabs in case this action put undo stress on the current #'s?? Do we want to resort to farm raising horshshoe crabs? Let Trout be Your guiding light& realise that the conservation minded methodology of fly fishing has been replaced by the spincast revolution &that alone destroyed an entire country& worlds ponds lakes & fisheries.We only have one chance to get this right..

From: Susan Kelliher
To: Marine Fish (FWE)
Subject: Horseshoe crab regulations and quota
Date: Saturday, February 21, 2026 3:46:32 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Sent from my iPad

Please do not raise any of the quotas of horseshoe crabs used for medical research. Further, stop or greatly reduce their use as bait.

Susan Kelliher
124 Kates Path
Yarmouth Port, MA 02675

From: Mary Olsson
To: Marine Fish (FWE)
Subject: stop exploiting horeshoe crabs
Date: Friday, February 20, 2026 8:08:13 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

i urge you to vote against any bill re horseshoe crabs.

Sent from Yahoo Mail for iPhone

From: Jay Weber
To: Marine Fish (FWE)
Subject: Horseshoe crab quotas
Date: Friday, February 20, 2026 7:05:41 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to provide formal comments on the Division of Marine Fisheries' (DMF) current proposal regarding horseshoe crab quotas.

The DMF's proposal acknowledges a declining demand for bait while simultaneously expanding the number of horseshoe crabs utilized for biomedical purposes. Given that horseshoe crab populations have not yet fully recovered statewide, I urge the Division to terminate the use of horseshoe crabs for bait. Furthermore, I recommend that the existing biomedical quota of 200,000 be maintained rather than increasing overall harvest pressure.

Horseshoe crabs are a public trust resource with essential ecological value. It is vital that management decisions prioritize conservation, transparency, and long-term population recovery.

Thank you for your time and for considering these comments.

Sincerely,

Dr. Jay C. Weber
Sandwich, MA

From: dafuss@verizon.net
To: Marine Fish (FWE)
Subject: Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries
Date: Friday, February 20, 2026 5:19:54 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a decades-long Massachusetts property owner to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

Every year as I walk the Cape shorelines, I see increasing numbers of dead horseshoe crabs. It is noticeable and deeply disturbing. These ancient creatures' numbers are decreasing at alarming rates. They have an important value and we must preserve them.

Given that DMF's own proposal acknowledges declining bait demand while expanding the number of horseshoe crabs used for biomedical purposes, and that horseshoe crabs have not fully recovered statewide, this is an appropriate moment to end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical quota, rather than expand overall harvest pressure.

Management decisions must prioritize conservation, transparency, and long-term population recovery. Our grandchildren are depending on you.

Thank you for your consideration on this crucial issue.

Sincerely,

Adrienne Muranyi
Marstons Mills

From: Shawn Szturma
To: Marine Fish (FWE)
Subject: Public comment on Division of Marine Fisheries' current proposal to change horseshoe crab quotas
Date: Friday, February 20, 2026 4:48:14 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am a resident of Arlington and Centerville writing to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

DMF's own proposal acknowledges declining bait demand while increasing the number of horseshoe crabs allocated for biomedical use. Given that horseshoe crab populations have not fully recovered statewide, this is an appropriate moment to reduce overall harvest pressure — not expand it. I urge the Division to end the use of horseshoe crabs for bait and maintain the existing 200,000-crab biomedical quota rather than increase total removals.

Importantly, one of the main reasons for harvesting horseshoe crabs for biomedical purposes — testing medicines for bacterial contamination — **no longer requires using crab blood**. A synthetic alternative called recombinant Factor C (rFC) is already available and works as well as or better than the traditional crab-based test. In 2023, the United States Pharmacopeia updated its standards to formally allow these non-animal testing methods, clearing a major regulatory hurdle. Because this effective alternative now exists and is being adopted, expanding biomedical harvest quotas is increasingly unnecessary.

Horseshoe crabs are a public trust resource with critical ecological importance to Massachusetts' coastal ecosystems, including migratory shorebirds and other marine species. Management decisions should prioritize conservation, transparency, and long-term population recovery, **especially when viable scientific alternatives exist.**

Thank you for considering my comments and for your stewardship of our Commonwealth's marine resources.

Sincerely,

Shawn Szturma
81 Walnut Street
Arlington, MA 02476

17 Maureen Road
Centerville, MA 02632

Mobile: 617-306-0467

From: S
To: Marine Fish (FWE)
Subject: Horseshoe crab catch limits
Date: Friday, February 20, 2026 4:33:34 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

Please do NOT increase annual quotas for horseshoe crabs. The biomedical industry needs to transition faster to alternative testing methods, and give horseshoe crabs, and other species in the same food web, a chance to recover.

Thank you,
Sandy Fosgate
Plymouth

From: Jane Johnson
To: Marine Fish (FWE)
Subject: Proposal to change horseshoe crab quotes
Date: Friday, February 20, 2026 4:02:48 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

I live on Cape Cod. The environment and our oceans are very important to me. Your DMF's proposal regarding the quotes for harvesting horseshoe crabs is wrong. We need to immediately end the use of horseshoe crabs for bait and maintain the existing 200,000 biomedical. Your data is not correct. We are endangering the existence of the horseshoe crab if we allow them to be used as bait. Thank you for considering my proposal. Sincerely, Jane Johnson, 1597 Long Pond Rd, Brewster, Massachusetts 02631
Sent from my iPad

From: jbennett1231@aol.com
To: Marine Fish (FWE)
Subject: Save the Horseshoe crabs please
Date: Friday, February 20, 2026 3:27:44 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a part time Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

I am surprised to read that Horseshoe crabs are harvested at all. I would think they have historical status and should be left to continue on in peace. Why would we touch such ancient work of art?

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,
Joan Tobin Bennett
Truro MA

From: Claire Kellylester
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Friday, February 20, 2026 3:24:03 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Director McKiernan,
I am a Massachusetts resident and am writing to comment on the Division of Marine Fisheries concerning horseshoe crab quotas.
I honestly believe this is the time to end using horseshoe crabs for bait and biomedical purposes.
I think it's cruel what they do to them to obtain their blood. Also their numbers have not fully recovered.
Horseshoe crabs are a public trust resource with critical ecological value
and management decisions should focus on conservation, transparency and long term population recovery.
If New York and Connecticut can end this process I believe Massachusetts can too.
Thank you for reading
Claire and Donald Lester
Plymouth,MA

Sent from my iPhone

From: Rosemary Shields
To: Marine Fish (FWE)
Subject: Leave the horseshoe crabs alone
Date: Friday, February 20, 2026 3:16:12 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

To: Mr. Dan McKiernan
RE: horseshoe crabs

Please do not increase any quotas, whether for bait or medical research. Leave horseshoe crabs in the environment and allow them to multiply and prosper.

Regards,
Rosemary Shields
93 Bay Road
Harwich MA 0264

From: Bill Sullivan
To: Marine Fish (FWE)
Subject: Horseshoe crab harvesting
Date: Friday, February 20, 2026 3:11:43 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Attention: Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Timothy Cernak, a medicinal chemist at the University of Michigan's College of Pharmacy states "The U.S. Pharmacopeia, an independent nonprofit organization that sets standards for the pharmaceutical industry and medication safety and efficacy, endorsed the transition away from crab blood to the synthetic alternative." Please put an end to the harvesting of horseshoe crabs for medical purposes.

Over the last 30 years there's been a dramatic drop along the Cotuit shoreline. Where there once was a plentiful amount of horseshoe crabs setting their eggs at high tide in the late spring. There is now only a handful.

Clandestine late night harvesting of horseshoe crabs happens along the coast and must end for the sake of the survival of a species and the food source they provide to migrating birds.

Bill Sullivan
Cotuit, MA
617-270-6220

Bill Sullivan
617-270-6220

From: James Rakowski
To: Marine Fish (FWE)
Subject: Horseshoe Crab Quota
Date: Friday, February 20, 2026 2:19:48 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan

I write to urge that DMF reconsider its proposed horseshoe crab quotas.

Given the importance of the horseshoe crab to the health of our marine ecosystem, and particularly to the wellbeing of migratory shorebirds, I ask that the proposed allocation of horseshoe crabs for bait be reduced to 75,000. This is in keeping with estimates of bait demand.

I further request that DMF reduce the allocation for biomedical use to 250,000. Such reductions are in keeping with other states' harvest levels, and will help the local population of horseshoe crabs recover.

I am certain you have an appreciation for the delicate balance that must be struck in deciding matters such as this. Please give the fate of these marvelous creatures your fullest consideration.

James Rakowski
40 North Falmouth Hwy
Falmouth MA

Sent from my iPhone

From: Carol Chittenden
To: Marine Fish (FWE)
Subject: Attn: Director McKiernan
Date: Wednesday, February 18, 2026 6:01:10 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

The proposed horseshoe crab quotas for 2026 seem difficult to justify in light of reduced interest in their numbers as bait, and the development of a highly successful synthetic version of Limulus Amoebocyte Lysate by both Charles River Laboratories and Associates of Cape Cod. Certainly some will be needed for ongoing research, and some will expire in that process. But is that any reason to disrupt the natural ebb and flow of their numbers beyond the minimum possible dislocation of their role in the ecosystem? That ecosystem is already under stress from multiple sources, and it would be shameful for the Massachusetts Division of Marine Fisheries to act as if it doesn't know that expanded quotas will exacerbate those stresses.

Sincerely,
Carol B. Chittenden
37 Carlson Lane, Unit 11
Falmouth, MA 02540

From:	patrick otton
To:	Marine Fish (FWE)
Cc:	sharl@horseshoecrabs.org
Subject:	Attention: Director McKiernan
Date:	Wednesday, February 18, 2026 2:54:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan McKiernan, Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan,

re: Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

I am permanent year-round resident of Harwich on Pleasant Bay. I have seen a decline in the horseshoe population. Please do not increase the quota for horseshoe harvesting. Horseshoe crabs are an important and intricate resource in the eco-systems of the marine estuaries. And they bring tremendous curiosity to visitors seeing them for the first time.

If anything decrease the quota by a fixed percentage every year. There is more to this world than making money off a species that has existed for at least 445 million now threatened today by humans.

Thank you.

Sincerely,
Patrick Otton
49 Kendrick Rd
Harwich, MA 02645

"when man destroys something manmade it is called 'Vandalism'
But when man destroys something of Nature it is call 'Progress'"

HUMANS are the Invasive species

Patrick Otton
617-244-2761
p_otton@yahoo.com

From: Sadie Pamet
To: Marine Fish (FWE)
Subject: Horseshoe Crab Management Comment attn: Daniel McKiernan
Date: Wednesday, February 18, 2026 11:52:58 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing as a Massachusetts resident to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

As I am sure you know, horseshoe crabs are a keystone species, supporting migratory shorebirds, fisheries productivity, and coastal ecosystem health. Their decline impacts the coastal food web, harming wildlife and fisheries alike. Protecting horseshoe crabs directly advances Governor Healey's biodiversity order by safeguarding a species essential to ecosystem resilience and food-web stability.

Given that DMF's own proposal acknowledges declining bait demand, this is an appropriate moment to end the use of horseshoe crabs for bait. The existing 200,000 biomedical quota can be met by synthetics that already exist, what is the logic behind increasing the quota without clear ability for oversight or transparency? How does that benefit the Commonwealth?

Horseshoe crabs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery.

Thank you for considering my comments.

Sincerely,

Eleanor Moody
Wellfleet, MA

From: Diane Siddell
To: Marine Fish (FWE)
Subject: horseshoe crabs
Date: Wednesday, February 18, 2026 10:43:38 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Good Day,
Please use any and all tools at your disposal to save our crabs. I feel they are being unfairly used and or killed. Such a fascinating, primal creature! Let's follow NY's lead and save them! This political climate and undoing of years long protection of not just this animal, but so many species., what a nightmare!
Thank you,
Diane Siddell
East Dennis MA
Sent from my iPad

From: turtledock@comcast.net
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Tuesday, February 17, 2026 7:43:21 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director Mckieran
Can we please stop exploiting these ancient and essential animals?
The whelk fishery is collapsing. And can use alternate bait. How about trying invasive and unwanted crabs? The horseshoe crab is too valuable to be “trashed” in this manner.
Big Pharma is developing a synthetic. All good. The horseshoe crab is too valuable to be bled dry to support Big Pharma’s greed.

The Horseshoe Crab is iconic. It has survived millions of years. It has inspired millions of children to become captivated by the wonders of nature. Its eggs - timed perfectly in availability - have supported billions of red knots over centuries to see them thru their migration.

There are few sights as moving as the horseshoe crab mating season. It is overwhelmingly uplifting and just plain awesome to watch. Please dont deny all of us this experience in the future.

New York has banned all
Harvest. Massachusetts should
follow suit. When they are gone, they are gone forever. They already suffer the threat of climate change and habitat loss. Dont further threaten their future. Show them the protection and support they deserve

Thank you

Judith Bruce
26 Towhee Lane
Orleans MA

Sent from my iPhone

From: Wendy Keeler
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Tuesday, February 17, 2026 7:41:35 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

To whom it concerns,

My husband and I own two houses in Bourne. The number of horseshoe crabs we see in Phinney's Point have lessened through the years. These animals have survived millions of years deserve to be protected. Is it not possible to farm them for the pharmaceutical industry? And to use them as bait is very hard to accept. They are sitting ducks when in shore. Please do what you can to protect them for future generations, our children and grandchildren, to witness them in the wild as a view to the prehistoric past, yet a harmless animal in spite of its unusual appearance.

Wendy Keeler
Bourne, MA

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Horseshoe crab concern
Date: Tuesday, February 17, 2026 10:10:06 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

From: Susan McNamara <mcnamaraandfamily@gmail.com>
Sent: Monday, February 16, 2026 7:49 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Horseshoe crab concern

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Dear Director McKiernan,

I am writing to express serious concern regarding the proposed changes to horseshoe crab quotas in Massachusetts.

Horseshoe crabs are a public trust resource, not a private commodity. Management decisions must prioritize ecosystem health, long-term sustainability, and the broader public interest; not expanded access for private companies. As a keystone species, horseshoe crabs support migratory shorebirds, fisheries productivity, and overall coastal resilience. Their continued decline weakens the entire food web and runs counter to the biodiversity goals advanced by Maura Healey. Removing crabs from spawning beaches before they reproduce undermines population recovery. There is no guarantee that a crab taken and later returned during the same season will successfully spawn. Disruption at this critical life stage has real biological consequences.

The proposal from the Massachusetts Division of Marine Fisheries expands exploitation rather than reducing it. Increasing the biomedical quota from 200,000 to 280,000 crabs, while routing an additional 100,000 bait crabs through the rent-a-crab program, raises a fundamental question: how does increasing total take align with conservation and recovery? The public deserves a clear explanation of how these harvest levels are consistent with the Commonwealth's trust responsibilities.

Horseshoe crabs are far too ecologically and medically valuable to be killed for bait in a depleted whelk fishery. Ending the bait fishery would immediately reduce mortality, simplify management, and allow the state to focus on recovery. Synthetic alternatives exist, and bait demand is declining. There is a better path forward.

Animal welfare concerns also cannot be dismissed. While some claim horseshoe crabs do not feel pain, organizations such as Humane World for Animals and Doctors Against Animal Experiments strongly disagree. Repeated bleeding, piercing the heart and removing up to a third of the animal's blood demands serious ethical scrutiny.

Transparency is another pressing issue. The "rule of three" under G.L. c. 130, §21 limits disclosure of fisheries data and restricts meaningful public oversight. If horseshoe crab recovery is truly the priority, DMF should evaluate non-public data through a conservation-first lens and clearly demonstrate how current practices support rebuilding rather than further decline.

Neighboring states such as New York and Connecticut have taken stronger conservation action. Massachusetts should lead, not fall behind. As recently highlighted by The Boston Globe, the Commonwealth is considering moving backward at a time when science and public sentiment support a shift toward sustainable alternatives.

Horseshoe crabs belong to the public. Management should reflect stewardship, restraint, and a clear commitment to recovery, not increased extraction.

Thank you for considering these comments.

Sincerely,

Susan McNamara

mcnamaraandfamily@gmail.com
781-901-3382

From: McKiernan, Dan (FWE)
To: Marine Fish (FWE)
Subject: FW: Please
Date: Tuesday, February 17, 2026 10:08:54 AM

Daniel J. McKiernan, Director
MA Division of Marine Fisheries
836 South Rodney French Blvd
New Bedford MA 02740
617 626-1536
dan.mckiernan@mass.gov

-----Original Message-----
From: Diane Siddell <dianemsiddell@aol.com>
Sent: Monday, February 16, 2026 4:39 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Please

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Good Day!
Please do whatever necessary to save our wonderful horseshoe crabs. Please follow NY's bold move to protect them across the board from death and destruction.
Thank you,
Diane Siddell
East Dennis MA 02641

Sent from my iPad

From: marthasmithdvm
To: McKiernan, Dan (FWE)
Subject: Public Comment: Oppose Expansion of Horseshoe Crab Harvest
Date: Monday, February 16, 2026 5:54:04 PM

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Dear Director McKiernan,

I am writing as a Massachusetts resident and veterinarian to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab quotas.

As a veterinarian and Faculty Fellow at Tufts University's Center for Animals and Public Policy, I approach this issue through a One Health lens, recognizing that the health of animals, ecosystems, and human communities are inextricably linked. Horseshoe crabs sit at a remarkable intersection of all three, and current management proposals fail to honor that interconnection.

Horseshoe crabs are a keystone species supporting migratory shorebirds, fisheries productivity, and coastal ecosystem resilience. They are also a public trust resource, not a private commodity. Management decisions should reflect that status by prioritizing conservation and long-term population recovery over commercial convenience.

Given that DMF's own proposal acknowledges declining bait demand, this is the moment to end the use of horseshoe crabs for bait entirely. These animals are far too ecologically valuable to be killed for a depleted whelk fishery. Ending the bait harvest would immediately reduce overall mortality, simplify management, and allow the Commonwealth to focus on recovery, directly advancing Governor Healey's biodiversity order.

Rather than reducing harvest pressure, the current proposal expands it. In 2023, DMF capped the biomedical quota at 200,000 crabs. Now, DMF proposes raising that cap to 280,000 while routing an additional 100,000 bait crabs through the Rent-A-Crab program to bleeding facilities. ***This is movement in exactly the wrong direction.*** Massachusetts should be phasing out both bait and biomedical harvest, not expanding either.

As a veterinarian, I am compelled to raise the question of animal welfare. The biomedical bleeding process involves cardiac puncture and extraction of approximately one-third of each animal's blood volume. The assumption that horseshoe crabs are incapable of suffering during this procedure is not settled science, and organizations including Humane World for Animals and Doctors Against Animal Experiments have challenged it. Synthetic alternatives to horseshoe crab-derived LAL already exist. There is no justification for continuing to subject these animals to an invasive and harmful procedure when a viable alternative is available, let alone for expanding the practice.

Furthermore, removing crabs from spawning beaches before they have spawned, even if they are later returned, disrupts reproduction with no guarantee of successful spawning. This undermines the very recovery that management should be working toward.

I am also concerned about the lack of transparency surrounding harvest data. The confidentiality provisions derived from G.L. c. 130, §21 prevent meaningful public oversight

of how a public trust resource is being managed. I respectfully ask that DMF evaluate its non-public data as if horseshoe crab recovery were the first priority, and explain how current and proposed harvest levels are consistent with conservation and the Commonwealth's public trust responsibilities.

Neighboring states are already moving in a more protective direction. New York and Connecticut have taken stronger conservation action. Massachusetts should lead, not fall behind, particularly when synthetic alternatives exist and bait demand is declining. The path forward is clear: end the bait harvest, cap and phase down biomedical use as synthetic alternatives scale, and manage horseshoe crabs as the invaluable public trust resource they are.

Thank you for considering my comments.

Sincerely,

Martha Smith-Blackmore, DVM, PSM-FS

Weymouth and Harwich, MA

Martha Smith-Blackmore, DVM, PSM-FS
President
Forensic Veterinary Investigations, LLC
Cell: 617.293.8183

Faculty Fellow
Center for Animals and Public Policy
Cummings School of Veterinary Medicine
Tufts University
North Grafton, Massachusetts

Co-author of
Investigating Animal Abuse Crime Scenes: A Field Guide
CRC Press, July 2023



Available now!

From: JAMES BAKER
To: McKiernan, Dan (FWE)
Cc: Sharl Heller
Subject: Horseshoe Crab legislation
Date: Monday, February 16, 2026 5:50:34 PM

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Dear Mr. McKiernan

I would like to endorse the legal effort involved in the preservation of the Horseshoe Crab (*Limulus polyphemus)*, the local foundational arthropod population that like other marine species is endangered by overfishing due to short-term economic thinking. At a time when climate change is proving so threatening, such action can enable us to sustain this ancient creature whose very survival depends on human responsibility, that is, being involved in and caring for the immediate world in which we live (*Dasein*), which transcends secondary questions of sentimentality, pragmatism or personal morality in my opinion.

James W. Baker
Plymouth. MA

From: Carol Jelinek
To: McKiernan, Dan (FWE)
Subject: Massachusetts" Horseshoe Crabs
Date: Monday, February 16, 2026 3:41:35 PM

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Dan McKiernan
Director, Massachusetts Division of Marine Fisheries

Dear Director McKiernan:

Horseshoe crabs deserve better from Massachusetts. With almost 450 million years behind them, we should be celebrating their resiliency, appreciating their contributions to our marine environment, and protecting them from harm. Instead, the Division of Marine Fisheries is working to increase the number of horseshoe crabs available for biomedical companies to use for bleeding, an invasive and inhumane practice.

With alternative methods now in use to detect bacteria in vaccines and other substances, there is little reason to continue to support private companies' abilities to harvest horseshoe crabs for medical purposes. The latest proposal would increase the quota for medical use and allow these companies to use an additional 100,000 crabs that are harvested for bait before they go to fishermen. Those crabs are often overwhelmingly the larger, female crabs that are crucial for the species to continue to survive. When we know that 15-30% of the horseshoe crabs bled and returned to the water do not survive, it is unconscionable that a state known for its nature conservancy would abandon a living fossil like the horseshoe crab to continued use in laboratories or as bait for a dying whelk industry.

As a resident of Cape Cod, I am well aware of the contributions the seasonal appearance of horseshoe crabs brings to our shores. Marine birds sustain themselves on the thousands of eggs the females leave in the sand each spring, enabling them to continue their journeys to northern climes. They help oxygenate the water for other organisms along the shoreline and provide a food source for various aquatic species. Every spring, the horseshoe crabs spur an interest in our seaside environment, as tourists watch the influx of brown creatures and their mating antics on our beaches.

These are all reasons we should be limiting or eliminating the harvest of horseshoe crabs for bait or biomedical purposes. I ask you to match the efforts of other east coast states to protect these unique beings and to recognize their contributions to the health of the marine environment that serves our fishing industry, adds to our towns' attractions, and offers engagement to our tourist communities on Cape Cod and along the eastern edge of Massachusetts.

Thank you,

Carol Jelinek
74 Brier Lane
Brewster, MA 02631
218-428-4188

From: Walter North
To: McKiernan, Dan (FWE)
Subject: Horseshoe Crabs
Date: Monday, February 16, 2026 3:31:44 PM

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Sir

I understand that the Commonwealth is considering expanding the permitted harvesting of horseshoe crabs. This amazing resource has been under unsustainable pressure for many years. Recent steps to constrain harvesting were welcome. Rather than reverse a prudent policy, I would encourage the Commonwealth to proceed more cautiously and carefully, particularly in weighing plans to augment bait takings. Bait takings need to be reduced and current biomedical quotas should be maintained.

Thank you.

w

From: John Hanlon
To: McKiernan, Dan (FWE)
Subject: horseshoe crab comments
Date: Monday, February 16, 2026 3:21:13 PM

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Mr. McKiernan,
I would like to register my request that you not increase the biomedical quota for your 2026 proposed horseshoe crab management plan. These crabs are a public resource and not one for a few private companies' profit. Their eggs are a vital resource for migrating shorebirds, and they are an enjoyable resource for the public to see. Synthetic replacements are now readily available in place of their blood. As a lifelong resident of Cape Cod, I have seen their population decline over the years and don't believe the state should be contributing to their demise by allowing any further take. There no longer is any biomedical public purpose being served.
Thank you for your consideration.
John Hanlon
West Harwich

From: ifish51@verizon.net
To: sharl@horseshoecrabs.org; McKiernan, Dan (FWE)
Subject: Horseshoe Crabs
Date: Monday, February 16, 2026 2:26:27 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hi Dan , I'm writing this letter in hopes that you will put forth some effort to save the Horseshoe crabs . as an old guy ,I remember when I was a kid and my Dad would take me deep sea fishing . We would catch huge Cod fish Stripers and Mackerel , all gone now because someone in power never took the time or gave a crap to regulate the amounts of fish taken ,or did anything to stop the trawlers from killing millions of fish in their nets to keep only a few species .and dump the rest back into the ocean , dead . Now when I go to the shore , It's like there never was any small fish crabs , mussels , .Walk along the shore , there's like Nothing alive . At what point do we start to give a shit about what's missing in our lives , and what our Grandchildren get to experience . All over the world people are doing this research without killing Horseshoe crabs . Is this one more thing we as Americans have to look like a bunch of Morons for .? As far as bait , every state uses ,the scraps from the fishing industry for bait , as well as other alternatives , What ,are the fishermen afraid they'll have to pay an extra 20. dollars a ton for bait ? Do the right thing for history and your Grandchildren .Dan Pease , Brian McQuillan

From: John Portnoy
To: McKiernan, Dan (FWE)
Subject: Proposed Limulus harvest
Date: Monday, February 16, 2026 2:15:01 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

I'm writing as a citizen and marine ecologist who has witnessed in my lifetime the severe loss of Horseshoe Crab spawning populations in eastern Mass and Cape Cod. Horseshoe crabs are a public trust resource, not a private commodity. Management should prioritize the public interest, ecosystem health, and long-term sustainability—not private commercial convenience.

The proposed management changes convert bait quota into biomedical take through the Rent-A-Crab program. Rather than reducing pressure on Horseshoe Crabs, this proposal expands exploitation at a time when conservation should be the priority.

When a horseshoe crab is removed from a spawning beach before it spawns, there is no guarantee it will successfully reproduce, even if it is later returned during the same spawning season. Disrupting spawning undermines population recovery.

John Portnoy, PhD
Wellfleet, MA

From: Steph DeFerie
To: Marine Fish (FWE)
Subject: Horseshoe Crab Protection
Date: Tuesday, February 10, 2026 11:26:47 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Please stop killing and harming horseshoe crabs! There are substitutions that the bio industry can make in place of horseshoe crab blood and fishermen can certainly find other bait to use. Save these creatures! Why are they less important that big business and fishermen making money????

Sincerely,
Steph DeFerie

From:	Ellen Simpson
To:	Marine Fish (FWE)
Subject:	Comment for February 24 public hearing
Date:	Tuesday, February 10, 2026 4:25:18 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Director McKiernan,

I'm writing in response to the proposed amendment to the Code of Massachusetts Regulations, seeking to "reallocate quota from the bait fishery for horseshoe crabs to the biomedical fishery." Now that synthetic alternatives to horseshoe crab blood have been approved for biomedical use, there is no reason to continue catching, and in many cases killing, horseshoe crabs.

I remember seeing horseshoe crabs in the water at Castle Neck near Essex in the 1970s and 1980s, and, being a child, I knew how special they were. It's easy to forget this as adults. Horseshoe crabs have been on the Earth for 250 million years, compared to humans' 300,000 or so years, and we have an obligation to respect and protect these ancient animals.

The state of New York will have banned harvesting horseshoe crabs by 2029. Massachusetts should do the same - if for no other reason than to not let New York outdo us!

Thanks for the work and consideration you're putting into this important issue.

Ellen Simpson
1 Geneva Street
Salem, MA

From: WS Ball
To: Marine Fish (FWE)
Subject: Horseshoe crabs
Date: Tuesday, February 10, 2026 10:14:30 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello.

Please please don’t increase the numbers harvested! Protecting horsheoe crabs is vital to our shorelines as well as possible future uses for their blood. PLUS, there are now good medical copies/alternatives. This is a horrible direction to go in!

Thank you.

Whitney Ball

From: zsazsa
To: Marine Fish (FWE)
Subject: Horseshoe crabs are too valuable for medical purposes to be caught as bait.
Date: Tuesday, February 10, 2026 9:05:17 AM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Horseshoe crabs, with their unique copper-based blood, are currently being fished out to be chopped up into bait. They have incredible value in medical testing and research. It's short-sighted idiocy to allow them to be fished for bait.

They're a very local coastal resource that is being fished out for bait. If we ban their use as bait, it's not as if we're going to lose them to unregulated foreign boats far offshore.

Please, consider banning them being caught for bait, and allow them to be caught only for medical use. They're disappearing. Stop them being caught for bait, appropriately regulate the number being caught for medical use and research, and they will be a valuable, sustainable fishery.

As things are going now, they'll soon be gone, chopped up for bait, and won't be available to us for medical use and research.

Sari K. Friedman, M.D.

From: Gwen Shipley
To: Marine Fish (FWE)
Subject: Attn: Director McKiernan
Date: Monday, February 9, 2026 7:49:57 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing about the proposed regulatory amendments at 322 CMR 4.00, 6.00, and 7.00, particularly those protecting horseshoe crabs. I loved finding horseshoe crabs as a kid and remember my mom teaching me how to handle them properly. Since then I have shown countless interested kids as well. So I am in support of any regulations that protect these strange, lumbering creatures.

Sincerely,
Gwendolyn Shipley
797 Fox Hill Road, Chatham

From: Anca Vlasopolos
To: Marine Fish (FWE)
Subject: Horseshoe-crab Quotas
Date: Monday, February 9, 2026 3:55:26 PM

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

To The Marine Fishery:

I fully endorse the proposed stricter quota of horseshoe-crab capture, euphemistically referred to as "harvest." Horseshoe crabs are extremely important for the continued existence of other species, especially the endangered red knots, who feed on the crabs' eggs during the birds' migration. Without this source of protein, many red knots do not have the necessary energy to accomplish their migration and to reproduce successfully.

Other bird species and animals depend on horseshoe crabs; the crabs' discarded shells after molting decompose into substances that enrich the intertidal richness that leads to healthier bivalves and other organisms.

Sincerely,
Anca Vlasopolos
580 Lumbert Mill Rd.
Centerville, MA 02632

"Monsters exist, but they are too few in numbers to be truly dangerous. More dangerous are [those] ready to believe and act without asking questions."—Primo Levi

From: McKiernan, Dan (FWE)
To: Morgan, Bradlie (FWE); Silva, Jared (FWE)
Subject: Fw: Comment for Public Hearing Proposal on Horseshoe Crab Quota Managemen
Date: Wednesday, February 4, 2026 10:03:41 PM

Get Outlook for iOS

From: Pam Youngquist <kali1111@bellsouth.net>
Sent: Wednesday, February 4, 2026 9:49:43 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Re: Comment for Public Hearing Proposal on Horseshoe Crab Quota Managemen

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dear Director McKiernan,

I am writing to firmly ask that you reconsider your current proposal on Horseshoe Crab Quota Management. I have serious concerns that private commercial interests, rather than long-term species recovery and ecosystem resilience, are driving these proposed management decisions.

Now is the crucial time for Massachusetts to affirm its leadership in environmental stewardship of all critical species and their recovery. We must take a significant real step toward protecting the essential species of Horseshoe crabs and the ecosystems of biodiversity that depend on them, following suit with our state neighbors New York and Connecticut.

Horseshoe crabs are ecologically invaluable animals. The harvest of them for use as bait in whelk and eel fisheries is an unnecessary and unsustainable practice, especially given the availability of alternative bait sources such as the invasive green crab, which are abundant in our waters and negatively impact the shellfish industry.
While you have created a state regulatory change with a partial ban on horseshoe crab bait harvesting during some part of the spawning season, this is still significantly insufficient to assure recovery of the species population. The state has recognized that this ancient creature is critical to the entire Atlantic coastal ecosystem.
Horseshoe crab harvesting in great numbers from our waters to be bled out in biomedical testing facilities is quickly becoming obsolete. This archaic practice is being successfully replaced with synthetic alternatives that are proving greater efficacy for human health. During product manufacturing, makers of injectable drugs, vaccines, and implanted medical devices must test every batch of the product to ensure they are free of endotoxin contaminants. There are multiple commercial testing options allowing companies to forego the horseshoe crab blood-based tests, instead opting for the horseshoe crab-free versions.

The United States Pharmacopeia, the quality standards group that indicates which tests are

accepted in manufacturing, adopted its policy which no longer requires blood-based endotoxin testing in July of 2024. USP began implementing the policy in November 2024, now endorsing the use of non-animal derived tests. At the end of 2025, Congress directed the U.S. Food and Drug Administration to update its guidance on endotoxin testing within one year, by close of 2026, to include the acceptance of synthetic alternatives for manufacturing products and to provide training for their use.

A robust and complete transition to lab-produced, horseshoe crab-free approaches to endotoxin testing can readily occur in all 4 of our national testing facilities - 2 of which are in Cape Cod as you know well. These methods offer greater reliability and consistency compared to traditional blood-based tests. They exemplify a well-rounded suite of advantages:

- **Scientific:** Horseshoe crab blood-based endotoxin tests are known to indicate false positives, meaning that with frequency they incorrectly indicate the presence of contaminants when contaminants are not present. As a synthetic product, the horseshoe crab-free tests do not contain the enzyme that triggers false positives.
- **Supply Chain:** Horseshoe crab-free methods help avoid supply chain vulnerabilities associated with depending on the blood of wild animals that are subject to environmental pressures, instead offering a stable, scalable supply chain not subject to environmental pressures.
- **Economic:** Given the high cost of medical products, companies must do all they can to keep the cost of research and development down. In the case of a supply chain disruption, it is reasonable to expect price hikes.
- **Environmental:** Horseshoe crabs are at the center of a complex food web that stretches from Maine to Florida —and even further. As you know well they are in trouble throughout that fishery. Declining and unwell horseshoe crabs have already impacted shorebirds that depend on the eggs of the crabs for sustenance on their migratory paths. The red knot, listed as threatened under the U.S. and Massachusetts Endangered Species Act, migrates from South America to its nesting grounds in the Arctic and back again, fueled in large part by horseshoe crab eggs—once found in abundance on our beaches. Adopting horseshoe crab-free methods of bait catch and biomedical processes allow fishermen and companies to meet sustainability and environmental goals.
- **Animal Protection:** To obtain the blood of horseshoe crabs, the animals are taken from the coast and transported to bleeding facilities, where as much as 1/3 of their blood is drained. Your proposal to then take those bled crabs as bait adds insult to injury. The research and testing community has widely accepted the principle of replacement of animal testing where possible. The many available synthetic versions allow companies to safely test for endotoxins with these replacements to animals, refining and normalizing the process with each company that embraces the 21st century shift to more effective scientific methodologies.

The ‘center’ is not holding currently for horseshoe crabs. Continuing loss of habitat, and exploitation by the bait and biomedical industries, have severely depleted this species population in Massachusetts, leading to near functional extinction. This decline has significant consequences for the entire ecosystem, including many commercially important fish and shellfish species.
Studies find “troubling decline” of horseshoe crabs in Long Island Sound | SeafoodSource, a recent study by Norwalk, Connecticut, U.S.A.-based The Maritime Aquarium reported a

“troubling decline” in the Long Island Sound horseshoe crab population, listing overharvest, bycatch, habitat degradation, climate change, and insufficient management as key threats to the animals.

Ending the ‘bait take’ will give horseshoe crabs and the species that depend on them for food, a real opportunity to recover. Ending the take of horseshoe crabs for biomedical bleeding will further enhance the species much needed break from harvesting. Horseshoe crabs do not reach maturity until 12 years of age. The extensive period of time between egg hatch and spawning creates incredible vulnerability to over-harvesting. That needs to be fully understood when we continually overreach by taking over 140,000 horseshoe crabs for bait and over 200,000 for biomedical bleeding annually. This is simply and completely unsustainable for this species.
We can join Connecticut's and New York's fine examples of legislation on this issue as they banned the hand harvest of horseshoe crabs in 2023 via Public Act 23-6, and in 2025 the Horse Shoe Crab Protection Act banning harvesting for bait and biomedical purposes respectively. Connecticut Governor Lamont stated: "This law says that we need to take a break and let this species regenerate and get back to a state of good health. I strongly urge our neighboring states to join this growing coalition and enact similar laws to protect the population in their waters.” “Horseshoe crabs have survived mass extinctions and dramatic changes to our planet, but they are now struggling to survive the impacts of human activity,” New York Assemblymember Deborah Glick said in a release. “Overharvesting for bait and biomedical use has pushed this ancient species into decline, with ripple effects being felt throughout coastal ecosystems. By signing this legislation into law, New York is taking decisive action to protect a living fossil and the many species that depend on it. This could not have been accomplished without the steadfast support and passion from advocates for environmental conservation across the state."
We have a strong need in this state for the first step in horseshoe crab legal recovery. DMF has the ability to do just that at this pivotal moment in this species crises by reconsidering your current proposal and reworking the recovery plan to truly benefit the horseshoe crab. Creating a category of Species of Special Concern would be more in alignment with that goal, in addition to the oft suggested refuge in Cape Cod Bay.
Thank you for the opportunity to provide comment.
Sincerely,
Pamela Youngquist Ph.D
163 Hillsdale Road
Great Barrington, MA 01230
(413)229-9013

To: Dan McKiernan, Director MA Division of Marine Fisheries
Marine.fish@ma.gov
March 4, 2026
Re: The DMF Proposal To Reduce the Horseshoe Crab Bait Quota by 40,000 and To Increase the Biomedical Quota by 80,000.

From: Deborah Cramer
Gloucester, MA

Dear Director McKiernan,

As I listen to the testimony at the hearings and look at the DMF data, and the areas of disagreement, I would ask you to consider:

- That improvements in the population of horseshoe crabs are too slight to meaningfully replenish this diminished species. You are measuring improvements from a time when the stock was already depleted, not from when it was abundant.
- That horseshoe crabs must be in abundance in far, far greater numbers in order to fulfill their foundational and functional role in coastal food webs, especially to provide necessary sustenance for shorebirds whose populations are tanking.
- That the take of so many horseshoe crabs is unnecessary when there is alternative bait for conch fishermen and widely available, proven alternatives to LAL.

The depletion of horseshoe crabs in Massachusetts began decades ago. The current proposal does not adequately manage this fishery to restore horseshoe crabs to their former historic abundance. Its assessment of uses a benchmark an already depleted population.

The decimation of horseshoe crab spawning beaches in Massachusetts began in the 1960s, with an ill-conceived bounty program to eradicate horseshoe crabs run by the Commonwealth. Horseshoe crabs were hauled off beaches, piled into trucks, and dumped in landfills.[1] The Commonwealth killed between 500,000 and one million horseshoe crabs a year in the bounty program.[2]

The bounty program ended, but the killing continued. In the 1990s, some 400,000 horse shoe crabs were taken annually to catch whelk. [3] As whelk declined, the biomedical industry began bleeding horseshoe crabs for lysate, taking some330,000 in 2024.

Results of this continued impoverishment are almost everywhere. Beaches all along the coast – in Gloucester, Duxbury, Ipswich, Chatham, Wellfleet – were once awash in spawning horseshoe crabs. During the bounty program, 3000 horseshoe crabs were removed in four days in Ipswich, thousands in a season from Chatham and Duxbury. Today, those beaches are mostly empty. A long-standing nursery on the north shore, once home to thousands of young crabs – babies as small as a fingernail and juveniles the size of hockey pucks - is now a ghost town. Compared to your records of spawning beaches in 2004[4] spawning today is scarce. A spawning season once extending into mid-July is now

[1] Rood, Ronald. (1967) The Crab that Isn't. *Audubon* May-June 1967. P38-42.
[2] DMF NEWS Second Quarter 2006, p8. DMF NEWS Second Quarter 2003 p6.
[3] Ibid.
[4] DMF Compliance Report to the ASMFC 2009.

truncated, in least one site, shortened by 80%. [5]. Ratios of male to female spawning horseshoe crabs, historically 2 to1, are now the highest along the eastern seaboard, skyrocketing to 8, 14, even 30 males to one female, portraying ap population in alarming decline.[6]

Horseshoe crabs were once a dominant species in coastal food webs. When they decline, other animals decline as well. The current proposal does not adequately consider the reliance of other species on horseshoe crabs

Horseshoe crab eggs and larvae are food for forage fish, killifish, and Atlantic silversides, that in turn feed larger perch, weakfish, northern kingfish, puffers, summer and winter flounder, and striped bass.[7] Eels, now depleted, once feasted on horseshoe crab eggs as they were laid.[8] In the 1960s, fish were once seen on Massachusetts beaches stranding themselves to get to horseshoe crab eggs.[9] The primary prey of loggerhead turtles, threatened in Massachusetts, was once horseshoe crabs, constituting more than 40% of their diet.[10]

When horseshoe crabs disappeared, so did the shorebirds that eat horseshoe crab eggs, their declines meeting the standards for the IUCN Redlist for Endangered Species standards. These losses are particularly pronounced in New England. International Shorebird Survey Data, analyzed by Dr. Paul Smith of Environment Canada, show dramatic population declines in the northeast U.S: Semipalmated Sandpiper, 42%; Sanderling, 86%; Ruddy Turnstone, 90%; Dunlin. 95%; Red Knot, 95%; Short-billed Dowitcher, 97%; Hudsonian Godwit, 99%.[11]

In "superabundance," horseshoe crabs support a rich web of life. Long before they are in danger of extinction, their loss reverberates through coastal food webs. The horseshoe crab is "in need of conservation, not to prevent extirpation, but to increase population density to restore its dominant status.[12]

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[5] Justin Widener and Robert B. Barlow. "Decline of a Horseshoe Crab Population on Cape Cod." *Biological Bulletin*, Vol. 197, No. 2: October 1999, pp. 300-302

[6] James-Pirri, M.J., Tuxbury, K., Marino, S., and Koch, S. "Spawning Densities, Egg Densities, Size Structure, and Movement Patterns of Spawning Horseshoe Crabs, Limulus polyphemus, within Four Coastal Embayments on Cape Cod, Massachusetts." *Estuaries* Vol. 28, No. 2, p. 296–313 April 2005. James-Pirri, M.J. 2012 "Assessment of Spawning Horseshoe Crabs (*Limulus polyphemus*) at Cape Cod National Seashore, 2008-2009." Natural Resource Technical Report NPS/CACO/NRTR—2012/573.

[7] Botton, M. L., and Shuster, C.N. Jr. (2003) Horseshoe Crabs in a Food Web: Who Eats Whom? Pp 133-153, in The American Horseshoe Crab, edited by Carl N. Shuster Jr., Robert B. Barlow, and H. Jane Brockmann, Cambridge, Mass.: Harvard University Press.

[8] Ibid.

[9] Rood, op.cit.

[10] Seney, Erin E., and John A. Musick (2007) Historical Diet Analysis of Loggerhead Sea Turtles (Caretta Caretta) in Virginia. *Copeia* 2:478–89

[11] Dr. Paul Smith, personal communication.

[12] Mattei, J., E. Kasinak, S. Senbel and K. Batholomew (2022) The Power of Citizen Science: 20 Years of Horseshoe Crab Community Research, Merging Conservation, Education, and Management. J. T. Tanacredi et al. (eds.), International Horseshoe Crab Conservation and Research Efforts: 2007-2020. Springer.

Massachusetts, located at the northern end of the range of the American horseshoe crab, with a historically later spawning season, is uniquely positioned to provide shorebirds' most nutritious and essential food, horseshoe crab eggs, on both the south and north legs of shorebird migration.

The DMF proposal to decrease the horseshoe crab bait take by 40,000 and increase the biomedical take by 80,000 compromises the recovery of diminished numbers of horseshoe crabs and shorebirds. Massachusetts has one of the highest biomedical and bait takes of horseshoe crabs along the eastern seaboard. Takes that high are unnecessary and unjustified.

This proposal continues to sanction killing one already diminished and compromised species, the horseshoe crab, to use as bait to kill another depleted animal – whelk. This is unnecessary.
By your own admission, whelk are depleted; overfished, with overfishing occurring and few mature females left in the sea.

A reduction of the bait take by 40,000 in light of New York's recent quota reduction, still leaves Massachusetts with one of the highest bait takes along the eastern seaboard

In 2019, you instituted a rebuilding plan to gradually increase gauge sizes so that by 2029, 50% of females in the sea would be mature. You've moved the rebuilding goal post back repeatedly to 2031, 2033, and then to 2036.[13] Is this fisheries management, or mismanagement?

Instead of reducing the bait take by 40,000, end it, and provide seed money to scale up the production of proven alternative bait, for example the crushed green crab surf clam belly power bar -- which uses an invasive species and reducing waste the surf clam fishery – or Canadian propellor clams. Alternative whelk baits tested in both the lab and the field are as effective as horseshoe crabs.[14] A commercial whelk pot fishery exists off the coast of England where there are no horseshoe crabs. Brown crabs and dogfish are the bait.[15]

New York is phasing out its horseshoe crab bait and biomedical fishery.[16] If Massachusetts doesn't do the same, New York fishermen will be taking Massachusetts horseshoe crabs. Reports are that that is already happening. When the MA quota is met, New York whelk fishermen will need to use alternative bait. Massachusetts fishermen can do the same. It's the same whelk.

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[13] April 14, 2021. *MarineFisheries* Advisory. Reminder: Whelk Gauge Since Increase in Effect for 2021. David Pierce, Director. Memorandum to Marine Fisheries Advisory Commission. Whelk Gauge Increase. Feb. 7, 2019. Daniel J. McKiernan, Director. Memorandum to Marine Fisheries Advisory Commission. Recommendation to Stay Scheduled whelk Gauge Increases. March 13, 2024. And Daniel J. McKiernan, Director. Memo to Marine Fisheries Advisory Commission (MFAC). March 13, 2024. Recommendation to Stay Scheduled Whelk Gauge Increases 2036

[14] Munley, Fairchild, Jury, et.al. "Laboratory investigations into alternative baits for the channeled whelk (*Busycotypus canaliculatus*)." *Fisheries Research* 271 (2024). Munley, et al., "Alternatives to Horseshoe Crab (Limulous polyphemus) as Bait for the Channeled Whelk (Busycotypus Canaliculatus) Trap Fishery." *Journal of Shellfish Research*, Vol. 44, No. 2, 281–287, 2025

[15] https://www.nw-ifca.gov.uk/managing-sustainable-fisheries/species/shellfish/whelk/

[16] https://legislation.nysenate.gov/pdf/bills/2025/S8823

End rent-a-crab.
By your own admission, almost all Massachusetts bait horseshoe crabs are rented to the biomedical industry for bleeding, propping up this ailing horseshoe crab bait fishery. When horseshoe crab blood is still used in an assay to protect human health during the transition to synthetics, it's wasteful to kill any horseshoe crab. Massachusetts is the only state with rent-a-crab.

Increasing the biomedical quota is unnecessary

The U.S. Pharmacopeia now sanctions recombinant endotoxin testing. The FDA is approving it. Eli Lilly has transitioned 80% of its endotoxin testing to recombinants. Synthetics are more effective, more reliable, more cost-effective, and don't depend on animals.

DMF's proposed biomedical take, 380,000 crabs a year including rent-a-crab, is 2 ½ times the annual 150,000 take in South Carolina, a take which, with no bait fishery, and no rent-a-crab, wiped out 30 horseshoe crab spawning beaches, depriving federally listed Red Knots of critical food. Lawsuits closed those beaches. [17] The depletion of South Carolina's horseshoe crab spawning beaches, and the consequent loss of federally listed shorebirds on those beaches should be a warning to Massachusetts. This loss occurred despite ASMFC assessments that the horseshoe crab stocks in the Southeast were doing well.

To restore horseshoe crabs to historic levels of the kind of abundance necessary to allow horseshoe crabs to fulfill their functional role in coastal ecosystems, please consider revising this proposal to: reduce the bait take not from from 140,000 to 100,000, but from 140,000 to zero, over two year period to match New York's ending the horseshoe crab fishery by 2029; end rent-a-crab; ,and instead of increasing the biomedical take to 280,000, pare it down, reducing it by 80,000 over the next five years.

Please manage our marine fisheries for a meaningful return to historic abundance. The 25 year court-ordered closure to a horseshoe crab take within the Monomoy National Wildlife Refuge in all likelihood is contributing to the possible stock increases in southern Cape Cod. The increased spawning in the Refuge is bringing back migrating shorebirds to eat their eggs – testament to the possibilities of repair and restoration.

Thank you.

Deborah Cramer
Gloucester, MA. 01930

Great Waters: An Atlantic Passage (W.W. Norton)
Smithsonian Ocean: Our Water Our World (Harper Collins/Smithsonian Books)
The Narrow Edge: A Tiny Bird, an Ancient Crab, and an Epic Journey (Yale University Press)
National Academy of Sciences Best Book
Society of Environmental Journalists Rachel Carson Book Award
Southern Environmental Law Center Reed Award
Volando a Orillas del Mar: El viaje épico de un ave playera que une continentes (Vázquez Mazzini, Buenos Aires)

[17] Consent Order Case 2:22-cv-00112-RMG Defenders of Wildlife and South Carolina Coastal Conservation League vs. South Carolina Dept. of Natural Resources and Charles River Labs. 8.23.2023

绝境 (Commercial Press, Beijing)
極境生機 (Yeren Press, Taiwan)

From: Rebecca Pugh
To: Marine Fish (FWE)
Subject: Attention Dan McKiernan: Rebeca"s second letter
Date: Friday, February 27, 2026 6:10:37 PM
Attachments: minister"s letter 2026 February 26.docx

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hi Dan,
This is the letter I sent to my church this week. You will see that it overlaps with the other essay (I wrote them three days apart) but it makes a more spiritual point.

Thank you so very much for all that you are doing.
Sincerely, Rebecca Pugh

From:	Rebecca Pugh
To:	Marine Fish (FWE)
Subject:	Attention: Dan McKiernan: in hopes of stopping horseshoe crab blood drawing and bait
Date:	Friday, February 27, 2026 6:06:44 PM
Attachments:	Hudsonian Godwit 2026.docx

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Dan,
I am Rebecca, a minister in the north of Massachusetts(Ipswich) and I have a column in the local paper in Ipswich. This was the article I wrote this week: on the hope that we might allow horseshoe crabs to keep their blood as well as not using them for bait in Massachusetts: my hope is that we will stop both the blood-letting and the bait usage, so their eggs can go forth to make baby horseshoe crabs and feed the migrating birds.

I also wrote a clergy pastoral letter this week about it, and I will send it in the next mail. The local paper goes out to 14,000 people. The minister's letter goes out to 340.

Thank you for everything, Dan.
I hope we get to be friends one day.
Most sincerely, Rebecca Pugh, Clergy, First Church in Ipswich

HORSESHOE CRAB RECOVERY COALITION

Via email submission
Director Daniel J. McKiernan
Division of Marine Fisheries
marine.fish@mass.gov

Subject:

Urgent Opposition to Proposed Increase in Biomedical Horseshoe Crab Harvest Quota

Dear Director McKiernan and Members of the Division,

On behalf of a group of concerned members of the Horseshoe Crab Recovery Coalition – a coalition of over 55 national and local conservation and healthcare organizations – we are writing to oppose the commonwealth's proposed increase in the biomedical harvest quota, and to urge the DMF to move expeditiously to end the bait harvest entirely.

While the American Horseshoe Crab has survived 450 million years and multiple mass extinctions, it is has failed to appreciably recover from the catastrophic population collapses of the 1990s. The Division's current proposal does not reflect a strategy for recovery.

The Myth of "Sustainable" Bleeding

The narrative that the biomedical harvest is a "no-kill" industry is a fallacy.

- **Rising Mortality:** With wild-harvest bleeding doubling to over one million crabs annually, according to Atlantic States Marine Fisheries Commission data, the industry's footprint is expanding at an unsustainable rate.
- **The 30 Percent Toll:** Research indicates that up to 30 percent of bled crabs die as a result of the bleeding process or suffer significant sub-lethal effects, impairing their ability to spawn.
- **The "Rent-a-Crab" Loophole:** Massachusetts' unique program – which routes bait-designated crabs to biomedical bleeding labs first – significantly adds to the scale of the blood harvest and undermines overall conservation goals.

Sustainable Alternatives Exist

Massachusetts is home to some of the same companies whose research has proven that we no longer need horseshoe crab blood to ensure patient safety. In effect, the bleeding companies are marketing the animal-derived agent side-by-side with the newer animal-free alternatives. Synthetic endotoxin tests are recognized by the US Pharmacopeia as equivalent and are currently used in at

least 10 FDA approved medicines including treatments for diabetes, obesity, COVID-19 and other sterile medicines and vaccines. Given the strong biopharmaceutical presence in Massachusetts, the state should be working to accelerate the transition – not give the bleeding industry the freedom to operate with relaxed limits.

A Regression in Regional Leadership

While the neighboring states of Connecticut and New York have taken decisive action to ban horseshoe crab harvesting, Massachusetts is moving in the opposite direction. Increasing the blood-harvest quota by more than 80,000 crabs is not just a regulatory oversight, it is a rejection of modern science and regional conservation trends.

Our Recommendation

The Commonwealth prides itself on conservation and scientific leadership. In the spirit of those ideals, and with regulatory equivalence between horseshoe-crab derived LAL and the newer synthetic alternatives fully established in the US, we urge the Division to withdraw the proposed increase in the biomedical harvest quota and instead prioritize the transition to sustainable synthetic equivalents.

Further, while we understand the intent of the proposed reduction in the number of crabs taken for bait, we believe that conservation interests are best served by moving to eliminate the bait harvest altogether. Anything short of that means that we are continuing to use one depleted species to catch another, thus perpetuating an unsustainable cycle of scarcity.

We also recommend that the Commonwealth actively facilitate research into the use of alternative baits, including an alternative bait made from parts of invasive green crabs and clams. This would help to ease the fishing community's transition away from use of horseshoe crabs, protecting an ancient and iconic species so vital to the health of coastal ecosystems.

Thank you for your attention to this critical conservation matter.

Sincerely,

Undersigned Members of the Horseshoe Crab Recovery Coalition

- American Bird Conservancy
- Center for Biological Diversity
- Coastal Expeditions Foundation
- Delaware Riverkeeper
- Group for the East End
- Maryland Ornithological Society
- National Wildlife Federation
- New Jersey Audubon
- One Hundred Miles
- Revive & Restore
- Save Coastal Wildlife
- Shark River Cleanup Coalition
- Southeastern Massachusetts Pine Barrens Alliance
- Wildlife Restoration Partnerships

Humane World for Animals

Formerly called the Humane Society of the United States and Humane Society International

1255 23rd St. NW, Suite 450
Washington, DC 20037
202-452-1100
humaneworld.org

March 5, 2026

The Commonwealth of Massachusetts Division of Marine Fisheries
30 Emerson Avenue
Gloucester, MA 01930
marine.fish@mass.gov

RE: Proposal on Commercial Horseshoe Crab Quotas

Dear Director McKiernan:

As a member of the Horseshoe Crab Recovery Coalition[1], Humane World for Animals (formerly called the Humane Society of the United States) appreciates the opportunity to provide comments on the proposed management plan affecting horseshoe crabs in Massachusetts. On behalf of our supporters in the Commonwealth, we are in strong opposition to an increase in the biomedical harvest quota.

Humane World for Animals is gravely concerned about the continued use of a component of horseshoe crab blood, Limulus amoebocyte lysate (LAL) for endotoxin testing of medical products, despite the availability of effective and reliable non-animal alternatives. To create this test, horseshoe crabs are captured from the wild and up to 30% of their blood is removed by medical supply companies.[2] The crabs are later returned to the wild; however, it is estimated that 15% or more of them die as a result of this process.[3]

Better alternatives for endotoxin testing exist. Scientists have developed recombinant Factor C (rFC) and recombinant Cascade Reagents (rCR) as alternatives to naturally sourced reagents for the Limulus amebocyte lysate (LAL) test. FDA approved drugs are on the market today using non-animal derived test methods[4] and multiple studies that have evaluated the efficacy of commercially available rFC tests have demonstrated that rFC is equivalent or superior to the LAL test.[5]

In November 2024 the U.S. Pharmacopoeia finalized publication of a new regulatory chapter which provides guidance for bacterial endotoxin testing using non-animal derived reagents. This new chapter provides guidance for manufacturers of new and existing biopharmaceuticals on how to incorporate

[1] https://hscrabrecovery.org/
[2] Maloney, T., et al. (2018). "Saving the horseshoe crab: A synthetic alternative to horseshoe crab blood for endotoxin detection." PLoS Biol 16(2): e2006607
[3] Atlantic States Marine Fisheries Commission (ASMFC). 2022. Review of the Interstate Fishery Management Plan for Horseshoe Crab (Limulus polyphemus): 2021 Fishing Year. Arlington, VA: 7.
[4] Lonza. 2018. “FDA Approves First Drug Using the Recombinant Factor C Assay for Endotoxin Testing.” Accessed March 7, 2024: https://www.lonza.com/news/2018-11-08-14-00
[5] See *supra* note 2 at 4.

rFC and rCR into their quality testing making it easier to adopt the synthetic alternatives.[6] With effective synthetic and human cell-based alternatives to this type of endotoxin testing, there is no scientific need to continue the biomedical use of horseshoe crabs.

Massachusetts is home to two companies—Charles River Laboratories and Associates of Cape Cod—that collect blood from horseshoe crabs for endotoxin testing[7]. Both companies have manufactured their own synthetic technologies that eliminate the need for horseshoe crab blood[8]. Despite their own statements[9] and clear scientific evidence that recombinant, animal-free methods can safeguard patient safety as effectively as traditional approaches, they continue to produce and promote horseshoe crab–derived testing products alongside these modern alternatives.

Horseshoe crab populations are at historic lows[10]biomedical use and the harvest for bait. Increasing the biomedical harvest quota will put the horseshoe crab population as well as threatened species that rely on their eggs for food in further danger.

Massachusetts risks moving backward on conservation, potentially exposing horseshoe crabs to increased overharvesting, while other Atlantic coast states including Connecticut[11], New Jersey[12] and New York[13] have enacted bans or imposed strict limits to safeguard their horseshoe crab populations.

Due to these reasons, Humane World for Animals opposes an increase of the biomedical harvest quota and urges the Division to move towards implementing a phaseout that would end both the biomedical and commercial taking of horseshoe crabs.

Respectfully,

Preyel Patel

---

[6] U.S Pharmacopoeia. 2024. "Chapter for endotoxin testing using non-animal derived reagents published for early adoption." Accessed November 25, 2024: https://www.usp.org/news/chapter-for-endotoxin-testing-using-non-animal-derived-reagents-published-for-early-adoption

[7] Kate Selig, Massachusetts Wants to Bleed More Horseshoe Crabs. What If There Was a Better Way?, Boston Globe (Feb. 10, 2026), https://www.bostonglobe.com/2026/02/10/science/horseshoe-crab-marine-fisheries-biomedical-industry/

[8] Associates of Cape Cod, Inc., Recombinant Cascade Reagent (rCR), ACCIUSA.com (last visited Feb. 26, 2026), https://www.acciusa.com/products-and-services/bet-products/recombinant-reagent

[9] Charles River Laboratories Int'l, Inc., Charles River Introduces the First Rapid Animal-Free Bacterial Endotoxin Test (Jan. 29, 2024), https://ir.criver.com/news-releases/news-release-details/charles-river-introduces-first-rapid-animal-free-bacterial-test

[10] Delaware Bay Horseshoe Crab Survey 1990-2022

[11] State of Connecticut, Governor Ned Lamont. 2023. "Governor Lamont Signs Legislation Banning the Harvesting of Horseshoe Crabs." Accessed September 12, 2025: https://portal.ct.gov/governor/news/press-releases/2023/08-2023/governor-lamont-signs-legislation-banning-the-harvesting-of-horseshoe-crabs?language=en_US

[12] NJ Spotlight News. 2024. "Officials uphold ban on harvest of female horseshoe crabs in Delaware Bay." Accessed September 12, 2025: Ban upheld on harvest https://www.njspotlightnews.org/2024/10/delaware-bay-female-horseshoe-crab-harvest-ban-stays-should-help-imperiled-red-knot-shorebirds/of female horseshoe crabs in Delaware Bay | NJ Spotlight News

[13] John Hurdle, New York to Phase In Protections for Horseshoe Crabs. The New York Times (Jan. 1, 2026), https://www.nytimes.com/2026/01/01/science/horseshoe-crab-protections-new-york.html

Humane World for Animals

Formerly called the Humane Society of the United States and Humane Society International

1255 23rd St. NW, Suite 450
Washington, DC 20037
202-452-1100
humaneworld.org

Massachusetts State Director
Humane World for Animals

February 25, 2026

Dear Director McKiernan,

We write to express our concern about the Division of Marine Fisheries proposal regarding the allowed take of horseshoe crabs for use as bait in commercial fishing and for the biomedical industry in Massachusetts.

The International Conservation Fund (ICF), which is based in Boston, is focused on protecting biodiversity and endangered species where they are most imperilled, and one of our programs is dedicated to protecting shorebirds. Shorebird populations are currently suffering steep declines at migratory staging sites along the Atlantic coast. Shorebirds, like the Red Knot, have relied on specific flyways for millennia, with their migration paths finely tuned to the rhythm of nature. For a mere 200-gram bird like the Red Knot to navigate a 15,000-kilometer flight, numerous factors must align. Any disruption along these flyways poses a severe threat, potentially leading to a collapse in the population of these incredible birds.

Horseshoe crabs play a foundational role in coastal ecosystems. Their eggs are a vital food source for local shorebirds, and migratory shorebirds such as the federally threatened Red Knot, as well as for numerous marine species of ecological and commercial importance. Horseshoe crabs are on the brink of functional extinction in Massachusetts. **To restore biodiversity along our shores, we must take immediate action to significantly reduce unnecessary mortality—starting with ending their use as bait and for bleeding by the pharmaceutical industry.**

DMF's proposal to reduce the harvest of these crabs for bait from 140,000 to 100,000 may seem like a step in the right direction, but in fact the reduction should instead be a complete ban. Even DMF has acknowledged that there are alternatives that could and should be used in this fishery, such as green crabs and surfclam bellies – resources that would otherwise go to waste.

There should also be no increase in the allowed take of these crabs for the biomedical industry. With widely available, more effective synthetic alternatives accepted by the by the US and European Pharmaceopeias, there is no longer any reason to bleed horseshoe crabs to make assays to test for endotoxin contamination in injected drugs and vaccines. The DMF's proposal to increase take for this industry from 200,000 to 280,000 just makes no sense, particularly as neighboring states such as New York and Connecticut are taking much stronger action to protect this species.

I write to you as a Director of ICF and also as a resident of Gurnet Point, Plymouth.

Sincerely,

Molly Bartlett

International Conservation Fund
for nature

Board of Directors
Molly Bartlett
Doug Bender
Gerard Bertrand
Meade Cadot
Wayne Klockner
Diana Papoulias
Philip Borden
Dexter Mead

Associates
David Agro
Aleks Evtimov
Scott Hecker

internationalconservationfund.org
617-781-2744
41 Beacon Street
Boston, MA 02108

EIN
83-4647086

From: John H
To: Marine Fish (DFG)
Subject: ATTN: Rebecca - SAVE LIMULIDS
Date: Monday, March 2, 2026 9:54:37 PM
Attachments: Screen Shot 2009-05-02 at 8.22.55 PM.png
Rocket Counter.MP3

CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

For Rebecca VIA Frank Mard--

Ode To the Lowly Limulus (Horseshoe Crab)

I am afflicted with *'Limulusitis'*.
Limulus—a crab who never will bite us.
My interest stems from my earliest years
When that scary crab would bring me to tears.

Later in life I'd grab him by the tail
To chase my sister and make her wail.
That was back then—a long time ago.
He's no longer scary and not a foe.

If ever he's stranded and turned on his back
This crab's easy prey, should a seagull attack.
Wise Mother Nature—Ah, she is clever!
Endowed him a tail that serves as a lever.

He turns himself over onto his twelve feet
And moseys away. No need to be fleet
For he is protected by a carapace—
Thus the survival limulus's race.

He's a prehistoric arthropod—
A species almost as ancient as God.
His home is down deep on the ocean floor.
But twice a year he will visit the shore.

Taking a risk, he leaves the deep waters
To venture ashore to make sons and daughters.
His missus lays eggs in the shallows' wet sand.
He hangs on behind her, completing God's plan.

He life is subdued, with little ado.
His predators have been, for aeons, quite few.
His primary enemy is greedy man
Who's harvesting Limulus fast as he can.

Uninformed scientists covet his blood...
And not just a little. They want a flood.
They'd like to drain every droplet of life
From him and his children and his dear wife.

Fie on mankind! We've once again struck
At Nature's weak spot. We're running amok;
Harvesting crabs at a rate that's insane
A practice that's making Ma Nature feel pain.

JWH 9.22.24-2.27.26

Note that you have been added to the Massachusetts Horseshoe Crab Collaborative newsletter list, which we (SEMPBA) produce.

I'd like you to try and answer the following questions, and send me a picture of you, to use in a story I will write for our sites.

THE PHOTO WILL HAVE TO WAIT AWHILE

· What sparked your interest in horseshoe crabs and coastal conservation?
I've been exploring the Chatham shores for 86 years. A couple of years ago I be interested in their juvenile Molts



· Can you share a memory from your youth on Chatham's coast that shaped how you see the environment today?
One incident stands out—defining moment occurred when the government decided to fill in the cut through that separated what are used to be Little Beach or HORN speech from Morris Island and water to prevent, so they said, stage Harbor from being filled in with sand flowing in from chatham hardware through the Cutthrough and into stage Harbor. This upset the local fisherman who now had to travel 9 miles south to round Monomoy point and then 9 miles back to get to Chatham Harbor. So they created a Cut through just south of Morris Island which has grown through the years from a narrow waterway to a wide span of open and navigable water. This enabled commercial fisherman as well as recreational boaters to go from Stage harbor to CHATHAM Harbor without having to steam 9 miles south to round Monomoy point and then 9 miles north to return.
." In 1957, the Corps completed a 10-foot-deep channel extending 2.5 miles from Chatham Roads in Nantucket Sound, around the southeastern flank of Harding Beach, to Stage Harbor. However, significant shoaling of the channel from Momomoy Beach to the south resulted in reevaluation of the plan. After a detailed study, the Corps relocated the channel from Chatham Roads directly through Harding Beach to the upper harbor. The 2.1-mile-long channel is 10 feet deep and 150 feet wide. Also constructed were a 500-foot-long stone jetty at the southwestern end of the relocated channel; a 2,500-foot-long sand dike extending from Harding Beach across the harbor to Morris Island; and a 1,500-footlong timber jetty adjacent to the dike (portions of the timber jetty were removed in 1982 and 1991 as a danger to navigation after deterioration rendered it no longer effective)."

· You wrote a poem about horseshoe crabs—what inspired it, and what message did you want readers to take away?
My concern for the demise of the Limulus species

· When did you first learn about the role of horseshoe crabs in the ecosystem and in biomedical industries?

Bill Sargent's fine Book "CRAB WARS" is about Horseshoe Crabs. It is to my knowledge the first of its kind and although written a few years ago is today a tremendous source of information on the subject of Limulus the horseshoe crab.

CRAB BLOOD is Gold—

https://horseshoecrab.org/poem/feature/crabblood0706/crabblood.html

· What changes have you seen in the local environment or fishing practices over the years?
Haven't followed it closely

· Why do you believe banning their use as bait and shifting away from biomedical harvesting is important?
Of course.

· What stories from your community would you want shared to illustrate why action matters?
????
· What imagery or scenes would you want readers to picture when they think of the horseshoe crab populations?

The shore bird the Red Knot is completely dependent on being able to gorge himself on horseshoe crab eggs when his migration halts at the Delmarva peninsula on his long journey from the Caribbean to the sub-Arctic regions. Without that feast he could never be able to manage to make that journey.



· If you could send one message to policymakers and one message to the public, what would they be?
Leave them alone before they're gone.

· Can you share a photograph of you at the coast, your studio, or with your artwork that could accompany the piece?

I'll email photo of yrs trly tomorrow if you wish

· Do you have any diaries, letters, or poems besides the one you wrote that illustrate your journey?

There's this one that you know. Perhaps you can suggest another angle for another poem.

Ode To the Lowly Limulus (Horseshoe Crab)

I am afflicted with *'Limulusitis'*.
Limulus—a crab who never will bite us.
My interest stems from my earliest years
When that scary crab would bring me to tears.

Later in life I'd grab him by the tail
To chase my sister and make her wail.
That was back then—a long time ago.
He's no longer scary and not a foe.

If ever he's stranded and turned on his back
This crab's easy prey, should a seagull attack.
Wise Mother Nature—Ah, she is clever!
Endowed him a tail that serves as a lever.

He turns himself over onto his twelve feet
And moseys away. No need to be fleet
For he is protected by a carapace—
Thus the survival limulus's race.

He's a prehistoric arthropod—
A species almost as ancient as God.
His home is down deep on the ocean floor.
But twice a year he will visit the shore.

Taking a risk, he leaves the deep waters
To venture ashore to make sons and daughters.
His missus lays eggs in the shallows' wet sand.
He hangs on behind her, completing God's plan.

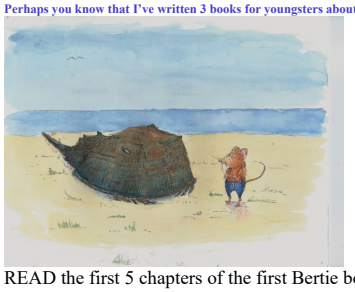
He life is subdued, with little ado.
His predators have been, for aeons, quite few.
His primary enemy is greedy man
Who's harvesting Limulus fast as he can.

Uninformed scientists covet his blood...
And not just a little. They want a flood.
They'd like to drain every droplet of life
From him and his children and his dear wife.

Fie on mankind! We've once again struck
At Nature's weak spot. We're running amok;
Harvesting crabs at a rate that's insane
A practice that's making Ma Nature feel pain.

JWH 9.22.24-2.27.26
==========

Perhaps you know that I've written 3 books for youngsters about a field mouse named Bertie. The first takes Bertie on an adventure to the beach where he and the reader enjoy encounters with some of shore's denizens..



READ the first 5 chapters of the first Bertie book
HERE
==========



….John,

“Bertie and the Lost Treasure of Skull Island” (*My second book*) already does something many middle grade adventures fail to achieve. It delivers classic treasure hunting excitement, memorable animal characters, and steady heart pounding stakes that speak directly to young readers who love pirates, mysteries, and fast moving journeys. The issue is not quality. It is reach.

Many strong children books are discovered by a few families, enjoyed quietly, and then fade without broader conversation or visibility. That pattern is rarely about the story itself. It happens because the right readers simply never encounter the book in a focused and credible setting.

I solve this by placing books like yours directly in front of active and verified readers through two structured channels designed for meaningful discovery rather than casual promotion.

First, your book is featured through our Reader Resonance Engine, a tailored email introduction sent to thousands of engaged readers who actively open messages specifically to discover new children and family friendly adventures. These are not cold lists. They are readers matched by interest and behavior who are far more likely to read, recommend, and follow an author long term.

Second, your title is positioned inside UK Book Club, an established and highly engaged Goodreads community made up of committed readers and parents who consistently participate in curated monthly selections. Only a small number of books receive focused placement each cycle. Selected titles are read together, discussed in depth, and repeatedly surfaced through dedicated conversations and recommendations. This creates concentrated visibility and credible word of mouth that continues well beyond a single reading period.

Authors who combine these placements typically see stronger discovery, active discussion, and lasting audience growth rather than a short spike of attention.

Availability each month is limited and based strictly on fit with reader interest. If you would like, I can outline exactly how this would work for Bertie and the Lost Treasure of Skull Island and what kind of reader response you can expect.

Kate
Moderator of UK Book Club
Goodreads Profile

DISCLAIMER: This invitation is extended deliberately. You are receiving it because your book stood out to our reader community. If this opportunity does not align with your goals, or if you have a different perspective on your book, you are welcome to disregard this message.

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· Are there local places (harbors, beaches, markets, schools) you’d like highlighted to ground the story in Chatham?
All Cape Cod Shorelines.





The author, poet & artist—Hutch with his Hattie
Let me know if there's more you'd like me to do.

Hutch

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March 6, 2026

Daniel J McKiernan, Director
Division of Marine Fisheries
Department of Fish and Game
The Commonwealth of Massachusetts
100 Cambridge Street, Boston, MA 02114

Dear Mr. McKiernan:

We are grateful for the opportunity to be able to comment on the Department of Marine Fisheries proposed regulation to reduce the horseshoe crab bait fishery quota in Massachusetts waters and increase the quota of crabs collected in the biomedical fishery. We hope our comments included in this letter will be beneficial to you and your staff, as well as the Marine Fisheries Advisory Commission, in the process of managing the Commonwealth's marine resources.

Manomet's shorebird conservation spans more than 50 years across the entire Western Hemisphere, allowing us to leverage resources to address pressing threats for shorebirds at some of the most critical sites. The shores of Massachusetts are one of those sites. Our focused research, as outlined below, has highlighted the complexity of shorebird dependence on horseshoe crabs. Given the steep declines in many shorebird species that rely on horseshoe crab eggs to fuel migrations, the scientific research that confirms the important role of this food resource in maintaining shorebird populations, and the changes within the fisheries industry, we recommend reducing the proposed bait harvest of horseshoe crabs for the 2026 season, and holding the 2023 quota cap for the biomedical fishery at 200,000 until more is known about mortality rates of this fishery. Below, we have outlined our preliminary findings and further recommendations to ensure that horseshoe crab populations are not further depleted, providing opportunities for the restoration of coastal food webs.

Background:
Our interest in successful horseshoe crab management in Massachusetts stems from the importance of horseshoe crab eggs as a food source for migrating shorebirds and other wildlife that feed on the eggs and crabs themselves. Manomet scientists have been studying shorebirds throughout the Americas since the early 1970's. In addition to our Plymouth-based staff, we have biologists and conservation specialists in Alaska, California, Louisiana, Texas,

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Georgia, Mexico, El Salvador, Honduras, Colombia, Ecuador, Uruguay, Brazil, Paraguay, Argentina, and Chile. Our work focuses on all measures of shorebird conservation from management-based research to implementing coastal zone restoration at critical sites that support these species as they undertake extreme migrations.

The work of our staff and more than 400 partners throughout the Americas has taken on new urgency in recent years as 26 shorebird taxa of 28 in eastern North America have shown negative population trends over the period 1980-2019 (Smith et al. 2023). Eleven of these most depleted species occur regularly in Massachusetts during their migration journeys. The trends over the thirty-nine year period have resulted in losses of between 70-90% for some species. A few of these prominent Massachusetts species exhibiting the greatest population declines include Red Knot, Hudsonian Godwit, Short-billed Dowitcher, Whimbrel, Ruddy Turnstone, Black-bellied Plover, and Semipalmated Sandpiper. We are committed to understanding and alleviating the threats these birds experience throughout their migrations across the Western Hemisphere.

To better understand how shorebirds are using coastal Massachusetts, and to help facilitate a broader understanding of the Commonwealth's role in the annual life cycle of migrant and wintering shorebirds here, we have been applying our international perspective and experience locally. We are currently concentrating our Massachusetts research and conservation efforts around four species, the Red Knot, Ruddy Turnstone, Hudsonian Whimbrel, and American Oystercatcher. To help guide our efforts, we initiated a coast-wide survey during the peak of southbound migration in early August. We call this the "Massachusetts Shorebird Blitz" where in 2025, more than 85,000 shorebirds were documented by 40 partners and 123 surveyors at 232 sites over 9 days throughout eastern Massachusetts. Results of the survey are here. We are interested in creating a northbound "blitz" in the near future to mirror the current volunteer effort.

Preliminary Findings:
Our work on Cape Cod has included: 1) extending International Shorebird Surveys into the spring "northern" migration period to document shorebird abundance; 2) conducting aerial surveys of horseshoe crabs during the peak spawning seasons in 2024 and 2025 to locate spawning crab clusters and estimate shorebird feeding aggregations; 3) conducting transect surveys for egg cluster density; 4) sampling across Pleasant Bay and Monomoy for Red Knot eDNA food analysis; and 5) tagging horseshoe crab egg-dependent Ruddy Turnstones to track local movements at Monomoy as well as their long flight migrations to breeding and wintering grounds. Much of this research is ongoing and preliminary (unpublished), but we do have a few highlight takeaways that we are glad to share.

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International Shorebird Survey (ISS):
The International Shorebird Survey, which Manomet developed in the late 1970's, has grown to become the primary means of estimating shorebird population trends across the country. For Massachusetts, the focus had previously been to conduct the surveys during the robust southbound migration period from July-September. We have expanded our work to include earlier "northbound" surveys due to our discovery of 1,500 Ruddy Turnstones feeding on HSC eggs on North Monomoy Island on June 1, 2023. This was a surprisingly high number of turnstones for one location in MA and observing them feeding on crab eggs helped us confirm the horseshoe crab and shorebird connection in Massachusetts. The sighting also inspired our aerial surveys to document other shorebird feeding aggregations.

Aerial Survey:
We have conducted aerial surveys for two years and they have covered the entirety of Cape Cod as well as one flight along the southern Massachusetts shore. Last year we were asked by the DMF biologist Derek Perry if we could also survey the Elizabeth Islands where horseshoe crab spawning data were not available. We did that in late May with a flight up and down the entire Elizabeths Chain and did not observe any spawning aggregations or numbers of crabs in any of the shallow embayments. Due to tidal variation in the region, we did not fly the Elizabeths at absolute high tide and could have missed a spawning event.

The only area of the Cape where we have consistently observed horseshoe crab spawning activity from the air is on the Monomoy National Wildlife Refuge in Chatham. We have also seen smaller aggregations of pre-spawning crabs in the shallows of the interior beaches of the Pleasant Bay Islands. Our flights have been restricted to a minimum of 500 feet, which makes shorebird observations more difficult than we expected, but crabs tend to stand out in the shallows as they approach the beach and are clearly viewed when at the waterline spawning. We consider these flights most valuable as a presence/absence measure for horseshoe crabs over wide swaths of the Cape's beaches and not as a tool for attaining actual estimates of numbers. This could change if we can standardize the flights and obtain permits to fly at a lower altitude.

Preliminary eDNA Findings:
We conducted a two-year (2022 & 2023) Environmental DNA (eDNA) study to analyze substrate and Red Knot fecal samples to understand prey selection and consumption in the Red Knots staging on Cape Cod during southbound migration (July-November). The results will be

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published soon, and will include confirmation of our observations, that shorebirds are feeding on horseshoe crab eggs on southbound migration on Monomoy and Pleasant Bay intertidal habitats. More specifically, we wanted to validate eDNA metabarcoding as an accurate, scalable, and cost-effective method for detecting invertebrate prey for shorebirds in intertidal flats.

Horseshoe crab DNA was relatively more abundant in Red Knot feces than in sediment samples. This provides quantitative evidence that horseshoe crab eggs serve as a food source for Red Knots during southbound migration. Horseshoe crab DNA was detected in fecal samples collected at Minimoy, North Monomoy, and Nauset Beach, from July through November. Red Knots have been shown to leave the Monomoy National Wildlife Refuge after feeding there for as long as 75 days and fly out over the continental shelf on migration as far south as the Caribbean and the north coast of South America. This shows the importance of Cape Cod as a southbound terminal staging location for Red Knots (Burger et al. 2012).

Ruddy Turnstone Tracking Study:
As the first year of a broader study, we fit four lightweight GPS-level transmitters on Ruddy Turnstones at Monomoy National Wildlife Refuge in the spring of 2025. The subsequent migrations north into eastern Arctic Canada where they breed demonstrated that Cape Cod is a terminal migration staging site, where Ruddy Turnstones, like other shorebirds, stage and feed heavily for weeks before launching for northern nesting grounds in eastern Canada and Alaska. A terminal staging site is of critical importance because it can influence the success of a breeding season and have important impacts of overall population trends.

Restoration of Horseshoe Crab Populations in Massachusetts:
In our commitment to restoring depleted shorebird populations across the Western Hemisphere, we seek opportunities to improve conditions throughout the known migration pathways of the birds. Horseshoe crab population restoration is one very achievable way for us to improve migratory health of shorebirds that we know depend on the crab eggs at terminal staging sites. Unlike other invertebrates the birds feed upon, fisheries management can positively influence the distribution and availability of an important food resource for shorebirds during the height of their energy- demanding migrations.

We believe that the current populations of horseshoe crabs in Massachusetts marine waters are much depleted from historic numbers. Decades-old records of large numbers of shorebirds gathered at horseshoe crab spawning sites in places like Wellfleet Bay's Jeremy Point, Plymouth

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Beach, and Duxbury Beach reflect historic populations that we have the potential to restore. A study conducted by the Marine Biological Laboratory at Woods Hole cites a measured decline of 83% of crabs in two Cape Cod locations in the span of fifteen years, between 1984 and 1999. We believe that the abundance of spawning crabs throughout Massachusetts coastal areas was likely similar or greater to what we observe now on Monomoy's western edge.

Restoration of this population will take time -- female horseshoe crabs take an astounding decade or more to reach sexual maturity. Therefore, the eventual impact of any management decision now with positive or negative population-level influence on crab numbers could take decades to be fully realized.

Manomet's primary interest in encouraging risk-averse horseshoe crab management is the strong link between the abundance and availability of horseshoe crab eggs and the migratory readiness of shorebirds that eat those eggs during the birds' energy-demanding migrations to and from Canadian and Alaskan breeding grounds. The horseshoe crab fishery has been acknowledged as very data-poor, and as such, needs to be managed with a conservative and cautious approach.

We commend the State's action in 2024 banning harvest during the spawning season. The current proposal to reduce bait harvest levels by 40,000 crabs has merit and is a good start. Additionally, a greater reduction to mirror reported bait demand is warranted, and we recommend lowering the 2026 quota to 75,000 crabs to reflect the current need. Ideally, this should be the start of shifting the bait fishery off of horseshoe crabs altogether. Strong candidates for bait replacement have been identified (Munley et al. 2024, and 2025) and tested both under lab conditions and in whelk pots in Cape Cod waters. The most favorable bait in these two studies included invasive green crabs, sea clams, and propeller clams.

Developing these alternative baits, especially those with components of invasive green crabs could be of great benefit to local fisheries communities in New England. According to Manomet's Senior Director of Fisheries, bait use in the fishing industry is frequently in flux, with the need for flexibility in any bait fishery to meet availability and demand. Thus, exploring the ubiquitous green crabs for whelk bait is worth testing given these proposed quota reductions.

When the State set the biomedical quota at 200,000 crabs in 2023, they recognized the risk of deteriorating Horseshoe Crab populations and overexploitation. Reflecting the cautionary approach the State demonstrated in the past, we recommend not increasing the biomedical

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quota to 280,000 crabs at this stage. We recommend holding the quota steady at 200,000 until more is known about the actual mortality of the biomedical fishery. Given the long maturation of female crab, leading to very long generational lengths, more time is needed to determine the efficacy of both the 2024 spawning closure and the 2023 cap on the biomedical quota before adjusting the quota upwards.

The estimated mortality of crabs processed for biomedical purposes and released is still largely unknown, especially in Massachusetts waters. Estimates in studies we have read have ranged from about 8% to almost 30% in one case. Your December 12, 2025 letter to the Marine Fisheries Advisory Commission suggests that the ASMFC and MADMF are both interested in studying the mortality rates of the crabs. Research is needed to understand actual mortality rates compared to the ASMFC's 15% level. Actual mortality could be lower than that, but if it is higher, closer to 20% or even to 30% for adult females, the projection of saving 28,000 crabs as a result of the current quota reallocation will not be accomplished. However, reducing the bait quota to the reported demand level of 75,000 crabs will "save" an additional 25,000 crabs, contributing to population viability.

I do hope our comments are useful as you contemplate next steps for Horseshoe Crabs. We would be happy to answer any questions you may have at any time.

Many thanks,

Elizabeth Schueler

Elizabeth Schueler, President

Cc: Brad Winn, Alan Kneidel, Liana DiNunzio

(citations below)

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Citations:

Munley, M. K., E. A. Fairchild, S. H. Jury, W. H. Watson, III & S. E. Edmundson. 2024. Laboratory investigations into alternative baits for the channeled whelk (*Busycotypus canaliculatus*) fishery. *Fisheries Res* . 271:106920. Available at: https://www.sciencedirect.com/science/article/pii/S0165783623003132

Mary Kate Munley, Shelley A. Edmundson, Steven H. Jury, Elizabeth A. Fairchild, and Winsor H. Watson III "Alternatives to Horseshoe Crab (Limulus polyphemus) as Bait for the Channeled Whelk (Busycotypus canaliculatus) Trap Fishery," Journal of Shellfish Research 44(2), 281-287, (18 August 2025). https://doi.org/10.2983/035.044.0211

Paul A. Smith, Adam C. Smith, Stephen Brown, Bradford Winn, Julie Paquet, Christian Friis Ornithological Applications, Volume 125, Issue 2, 1 May 2023, duad003, https://doi.org/10.1093/ornithapp/duad003

Joanna Burger, Lawrence J. Niles, Ronald R. Porter, Amanda D. Dey, Stephanie Koch, Caleb Gordon Migration and Over-Wintering of Red Knots (*Calidris canutus rufa*) along the Atlantic Coast of the United States *The Condor: Ornithological Applications*, Volume 114, Issue 2, 1 May 2012, Pages 302–313

Dan McKiernan February 28, 2026

Director, Massachusetts Division of Marine Fisheries (DMF)

marine.fish@mass.gov

Dear Director McKiernan,

The New England Coastal Wildlife Alliance (NECWA) is a nonprofit organization founded in 2005 and based in southeastern, MA. NECWA staff, interns, and volunteers work hard to rescue and research the unique coastal marine wildlife of New England. I am writing on behalf of our constituents to comment on the Division of Marine Fisheries' current proposal to change horseshoe crab (HSC) quotas for bait used in the whelk fishery and for bleeding by biomedical facilities.

Our View

We oppose the current DMF proposal to reallocate a portion of the HSC bait quota to the biomedical industry, thereby increasing the number of HSCs bled by the 2 Cape Cod biomedical companies. We also oppose the continuation of harvesting horseshoe crabs used in the Rent-A-Crab program, reducing the number of HSCs bled by biomedical companies.

Why End the Bait Harvest

Given that DMF's own proposal acknowledges declining bait demand, this is an appropriate time to end the use of HSCs for bait in the whelk fishery. There is always an alternative bait that can be used in any fishery. Given the importance of HSCs for public health and in our coastal marine ecosystem, this species is too precious and important to continue to support a failing fishery. Again, this would mean ending the Rent-A- Crab program.

Reduce or End Bleeding by Biomedical Companies

This is also the time to reduce the number of HSCs bled for biomedical purposes by the 2 Cape Cod biomedical companies. The U.S. Pharmacopeia (USP) has approved synthetic alternatives to horseshoe crab blood for biomedical testing. That synthetic material, Recombinant Factor C (rFC), is said to be just as good if not better than HSC blood for most biomedical needs. This change aims to protect both the HSC population and other marine wildlife that depend on HSC or their eggs for food.

Mortality Rates and Better Oversight for Bled Horseshoe Crabs

DMF needs to conduct research on mortality estimates for HSC crabs that are bled by biomedical facilities. We need more accurate mortality figures that examine the short-term and long-term impacts of bleeding individual crabs. Even though a recently bled HSCs are returned to the wild alive, do they behave normally and are able to feed, socialize, and migrate as needed? Or in their weakened state, are they more prone to infections, predation, and starvation? Who monitors harvesters or people who provide HSCs to the biomedical facilities? Do financial pressures encourage them to harvest larger individuals (i.e. females) regardless of whether these female crabs were collected and bled previously that season? You cannot expect an industry to monitor itself for we have seen many times in the past that that never works. Where is the oversight? Where is the transparency from DMF and the bleeding facilities that Massachusetts taxpayers deserve?

Extend the Ban on Harvesting Horseshoe Crabs through the Historic Spawning Season

We advise DMF to extend the ban on harvesting HSCs throughout the entire spawning season which historically has been through the end of July. This is the only way to protect this species during this critical and very important time in their life cycle.

What will our Legacy Be?

Unregulated and financially motivated harvesting of HSC by the biomedical industry and the fishing industry, along with habitat destruction due to issues related to climate change, has led to a marked decline in the horseshoe crab populations in the United States.

NECWA feels that any type of harvesting is an ecologically unsustainable practice. HSCs are a public resource and a vital component of the marine ecosystem and essential to coastal biodiversity. Their prime value should not be as a commercial commodity. If we are to deal with the impacts of climate change (now and in the future), we must anticipate and prepare for unpredictable future events.

We are concerned that money, not science, is driving management decisions and we hope that DMF will do the right thing by protecting HSCs and their environments for generations to come. We need State and Federal institutions and organizations to be forward thinkers who envision a better future for our children and their children. What is the legacy that we want to leave as individuals, as organizations, and as institutions. It is up to DMF to stand strong and do what is best for HSCs so we can ensure their survival for future generations.

Thank goodness we had people who created landmark legislation that cleaned up our planet and made it a more diverse and healthier home for all inhabitants. We are referring to the Clean Air Act of 1963, the Clean Water Act of 1972, the Marine Mammal Protection Act of 1972, and the

Endangered Species Act of 1973. In our minds, HSCs are a public trust resource with critical ecological value, and management decisions should prioritize conservation, transparency, and long-term population recovery over financial benefits that the State, Towns, or private industries may receive.

Thank you for considering my comments.

Sincerely,

Carol “Krill” Carson



President and Founder, NECWA

Marine Biologist

krillcarson@me.com

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New England Coastal Wildlife Alliance (NECWA)

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From:	Winsor Watson
To:	Marine Fish (FWE)
Subject:	Info for Dan McKiernan
Date:	Wednesday, March 4, 2026 7:12:27 AM
Attachments:	Munley alternative whelk bait 2024.pdf Munley et al. 2025 JSR.pdf Smith IUCN Aquatic Conservation - 2023 - Smith.pdf

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CAUTION: This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Dan

I have heard through the grapevine that DMF is contemplating some changes in the rules and regulations concerning the harvesting of horseshoe crabs for bait. In the last 5 years or so, in collaboration with some of my colleagues and students, I have been investigating the use of alternative baits for the whelk fishery that do not include parts of horseshoe crabs.
We have tested these in the laboratory and we have tested them in the field.
I have attached two papers we have published on the subject.
The bottom line is that some of these alternative baits work and they could be developed further to provide an alternative bait that is also cost effective.
Recently, due to harvesting for both whelk bait and biomedical purposes, horseshoe crab populations have been endangered and there is sufficient concern for some populations to be placed on the IUCN red list (see attached paper).

In recent years the lobster fishery has been managed very effectively by including industry partners, scientists and managers in a cooperative effort to keep the fishery viable economically and keep the population sustainable. That should also be possible with the whelk fishery as well.

If you have any further questions, feel free to reach out to me.

Best,

Win Watson
Emeritus Professor
UNH

Via email submission
Director Daniel J. McKiernan
Division of Marine Fisheries
marine.fish@mass.gov

March 6, 2026

Re: REVISING THE HORSESHOE CRAB HARVEST QUOTAS

Dear Director McKiernan:

Pursuant to the February 25, 2026, Updated Notice of Public Hearing and Comment Period issued by the Division of Marine Fisheries, the Center for Biological Diversity and American Bird Conservancy respectfully submit the below comments opposing the agency's Proposal on Horseshoe Crab Quota Management. We appreciate the opportunity to comment and look forward to the Commonwealth's consideration and engagement with the information below.

I. Introduction and Overview of Comment.

Horseshoe crabs are living fossils whose species are nearly twice as old as the dinosaurs. They are body-armored arthropods with ten eyes and a long, spiked tail. Each spring, they arrive on beaches to lay eggs in massive spawning events that may be the oldest and longest-running migrations in the world. Yet their population is crashing and has declined by 70% over the last few decades.

Until this year, Massachusetts had begun to take a leadership role to limit the species' steep decline. For example, it restricted harvesting for bait in certain areas, and recently restricted harvesting by hand during periods when the crabs come ashore to spawn.

Contrary to the Commonwealth's recent strides, this year's Division of Marine Fisheries ("DMF") proposal to amend regulations to "reallocate" the quota of horseshoe crab harvests is a step backward. The quota reallocation will increase the number of harvested, killed, and otherwise negatively affected horseshoe crabs. The harvesting, killing, and blood-draining activities it will authorize will have deleterious ecosystem effects—including depleting important food sources for the red knot and the loggerhead sea turtle, two species listed under the federal and state Endangered Species Acts. Indeed, red knots rely on horseshoe crab eggs to sustain them during their long migration to the Arctic to breed; by reducing horseshoe crab egg availability and depleting their primary food source at key stopover beaches, this quota increase will further destroy a species that is clinging on to survival. Massachusetts' regression is in clear contrast to its southern neighbors—both Connecticut and New York have enacted legislation or regulations to prohibit horseshoe crab harvesting.

None of this environmental damage needs to happen. The Massachusetts industry that uses horseshoe crabs for bait—the whelk fishery—is in massive decline. In addition, feasible alternatives to dead or bled horseshoe crabs exist in both the bait and biomedical industries.

In light of the quota proposal's risk of unnecessary damage to the horseshoe crab population and the species that rely on horseshoe crabs and their eggs for survival, DMF must comply with the Commonwealth's bedrock environmental laws—the Massachusetts Endangered Species Act ("MESA") and the Massachusetts Environmental Policy Act ("MEPA")—before taking any action. In undertaking the review processes required by both laws, DMF will discover that the laws call for any changes to the harvest quota to swing in the other direction. Accordingly, DMF should join its southern neighbors and ban the bait harvest and phase out the biomedical harvest for horseshoe crabs.

II. The Division of Marine Fisheries' New Quota Proposal Will Increase the Number of Killed and Otherwise Harmed Horseshoe Crabs.

On its face, the Division of Marine Fisheries' proposed quota increase will magnify harvesting, killing, and interference with spawning activities of horseshoe crabs. *See* Dec. 12, 2025, Memorandum from Daniel McKiernan re: Horseshoe Crab Quota Management ("Dec. 2025 McKiernan Memo") (attached as Ex. A). It will "reduce the bait crab quota from 140,000 crabs to 100,000 crabs" while at the same time "increasing the biomedical quota from 200,000 crabs to 280,000 crabs," *id*. at 1, resulting in a net harvest increase of 40,000 crabs.

But in the proposal, DMF argues that this proposal will lead fewer killed crabs. *Id*. at 2 ("In this instance, the proposal will actually reduce overall mortality by about 28,000 crabs annually, assuming a 15% biomedical mortality rate"). This is mistaken on multiple levels.

First, in the same proposal document, DMF acknowledges "the current local bait crab demand approximates 75,000 – 90,000 horseshoe crabs annually," and that reducing the bait quota will still "provide a more than sufficient supply of crabs for the state's conch pot fishery." *Id*. at 1. Thus, DMF reducing the quota from 140,000 to 100,000 crabs (the latter still being *above* the expected demand) has the effect of only reducing the number of crabs killed for bait on paper—not in the real world. In other words, the proposed bait quota reduction will not cause a real-world effect of reducing the number of horseshoe crabs killed for bait. Yet DMF uses this supposed reduction as justification to increase the biomedical harvest quota by 80,000 crabs. Because there is no real-world reduction of horseshoe crabs killed for bait, the net result of the quota adjustments is simply an increase of 80,000 crabs harvested for biomedical bleeding purposes. Even with DMF's overly optimistic assumption of 15% mortality rates for biomedical harvest, this would mean an increase of 12,000 killed crabs in Massachusetts.[1]

[1] Moreover, if industry fills the remaining bait harvest quota through the Rent-a-Crab program, this will mean that—using DMF's estimation of the current bait demand—with DMF setting a 100,000-bait harvest quota, 10,000 to 25,000 horseshoe crabs will be killed even though they are sought for biomedical bleeding purposes only. Unnecessarily killing tens of thousands of individuals of a vulnerable species is not, as DMF contends, "beneficial to conservation." *See* Dec. 2025 McKiernan Memo at 2.

Second, DMF acknowledges "some uncertainty" about the actual mortality rate for horseshoe crabs harvested under biomedical bleeding permits. In fact, the 15% mortality rate that it relies on is far rosier than focused study of local harvesting and bleeding process. For example, in a 2010 DMF-funded study that sought to mimic typical practices in Massachusetts, researchers found mortality of female horseshoe crabs bled and "held overnight as is the current practice" suffered a mortality rate of 29.8%. *See* Leschen & Correia, *Mortality in female horseshoe crabs* (Limulus polyphemus) *from biomedical bleeding and handling: implications for fisheries management*, 43 Marine & Freshwater Behaviour & Physiology 135-147 (2010) (attached as Ex. B). The mortality rate could be even higher when harm from harvest, transport, return to the water, and post-bleeding health are incorporated into the analysis.

Third, DMF also acknowledges "there remains some uncertainty" with the "sublethal impacts of biomedical processing on horseshoe crabs." Dec. 2025 McKiernan Memo at 2. Aside from this general statement, the increased quota proposal says nothing about whether the crabs who do survive the bleeding process and placement in the water continue to live out full life spans and continue to spawn, and whether the surviving females produce eggs in the same abundance, at the same time, same location, and with the same reproductive success rate as otherwise would have happened had they not been harvested and drained of blood.[2] The increased harvest proposal is silent on these points likely because DMF does not know the sublethal effects of biomedical bleeding and processing on horseshoe crabs individually and at the population level in Massachusetts.

The biomedical harvest and bleeding process is so opaque that the following basic questions about practices in Massachusetts go unanswered:

- How do we know how many horseshoe crabs survive the biomedical harvesting and bleeding process in Massachusetts? Does this estimate come from any Massachusetts-specific studies?[3]

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[2] Studies show that these sublethal and delayed lethal effects likely do occur and can have drastic effects on horseshoe crabs, both individually and at population level. *See, e.g.*, Kurz & James-Pirri, *The impact of biomedical bleeding on horseshoe crab,* limulus polyphemus*, movement patterns on Cape Cod, Massachusetts*, 35 Mar. Fresh. Behav. Physiol. 261 (Jul. 2002) (attached as Ex. C) (finding dead bled crabs weeks after return to water from bleeding, and finding bled crabs more "disoriented" than non-bled crabs, which may lead to "a reduced reproductive output compared to those that are not bled"); Anderson et al., *Sub-lethal behavioral and physiological effects of the biomedical bleeding process on the American horseshoe crab,* Limulus polyphemus, 225 Biol. Bull. 137 (Dec. 2013) (attached as Ex. D) (finding bled crabs have "significant decreases in the linear and angular velocity of freely moving animals, as well as changes in their activity levels" and "reductions in hemocyanin levels, which may alter immune function and cuticle integrity"); Owings et al., *Effects of the Biomedical Bleeding Process on the Behavior of the American Horseshoe Crab,* Limulus polyphemus, *in Its Natural Habitat*, 236 Biol. Bull 207 (Jun. 2019) (attached as Ex. E) (concluding that, "[t]aken together with the results of many previous investigations, it appears as if the biomedical bleeding process might have some behavioral impacts that could impact the sustainability of harvested *Limulus* populations").

[3] The December 2025 McKiernan Memo generally describes "future at-sea monitoring to determine the recapture of bled crabs," but this does not make a commitment to undertake such monitoring. DMF also

- To where do biomedical companies return horseshoe crabs after bleeding them?
- What guides the decision on returning horseshoe crabs to a specific location?
- Does anyone monitor the industry actors to ensure they are following careful handling practices and returning the crabs to a desired location?
- What monitoring protocol (if any) does Massachusetts have in place to monitor biomedical harvesting, processing, and returning crabs to water?

Without knowing the lethal and sublethal effects of the biomedical bleeding process, DMF is wrong to confidently assert that the proposed quota reallocation is "beneficial to conservation," will "manag[e] horseshoe crabs for abundance," and "will actually reduce overall mortality by about 28,000 crabs annually."

III. Increased Harvesting of Horseshoe Crabs Will Cause Harm to Federal- and State-listed Endangered Species Act Species.

a. The horseshoe crab population in both the United States and in Massachusetts has fallen off a cliff and is not yet recovering.

Over the past three decades, horseshoe crab populations have crashed by more than 70% across their range. Horseshoe crabs are being overharvested, and their spawning beaches are threatened by development, dredging, erosion, pollution, climate change, and sea level rise.

Humans harvest horseshoe crabs either to turn them into bait or to drain their blood. Horseshoe crab harvests for use in commercial whelk and eel fisheries spiked in the 1990s, which resulted in a massive crash in horseshoe crab populations. Horseshoe crabs are also harvested by the biomedical industry for their blood; Limulus Amebocyte Lysate (commonly referred to as "LAL"), a clotting agent in horseshoe crab blood, is used to test drugs and intravenous devices for bacterial endotoxin. Horseshoe crab populations have not recovered.

Horseshoe crab spawning has also decreased sharply in the past three decades. In a related manner, horseshoe crab egg densities on spawning beaches have declined steeply across their North American range. The outlook for the species is so dire that in 2023, the International Union for the Conservation of Nature ("IUCN") assigned the horseshoe crab a recovery potential score of zero. *See* Smith et al., *Limulus polyphemus*, The IUCN Red List of Threatened Species (2016), *at* https://www.iucnredlist.org/species/11987/80159830 (last visited Mar. 1, 2026).

Massachusetts is no different—the population has cratered here, too. Historical records reveal the former abundance of horseshoe crabs in Massachusetts. Even before Massachusetts began a commercial whelk fishery, which utilizes horseshoe crabs as bait, Massachusetts experienced a period of extensive horseshoe crab destruction. In the mid-20th century, the Commonwealth implemented a predator control program to protect soft shell clams for fishermen by offering subsidies to cities and towns that provided a bounty on horseshoe crabs. During this period, participating fishermen killed over half a million horseshoe crabs annually.

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established the biomedical horseshoe crab quota in 2023—has DMF been collecting recapture data since at least 2023? If not, why not? And if so, where is that data and DMF's analysis of it?

After the past twenty years of efforts at regulation, horseshoe crab data in Massachusetts do not suggest the species is recovering from decades of heavy exploitation. In multiple attempts at surveying the species over the past ten years, researchers have concluded that population trends for the horseshoe crab in Massachusetts are, at worst, "decreasing" and "poor/declining," or at best, "neutral" or "mixed." *See* Smith et al., *Conservation status of the American horseshoe crab (Limulus polyphemus)*, Reviews in Fish Biology and Fisheries 27:135-175 (2017); ASMFC 2013 Horseshoe Crab Stock Assessment Update at 16 (Aug. 2013),[4] ASMFC 2024 Horseshoe Crab Stock Assessment Update at 8 (Apr. 30, 2024).[5] But data on the species and its trajectory are limited—Massachusetts trawl surveys alone do not provide important details about horseshoe crabs that would be gained by tracking horseshoe crabs not only by sex but also by maturity level, distinguishing between juvenile, newly mature, and mature female horseshoe crabs.

b. Red knots are suffering a steep decline and harvesting more horseshoe crabs will exacerbate that trend by depleting horseshoe crab eggs.

The red knot, scientific name *Calidris canutus rufa*, is "a long-distance migratory shorebird known for nonstop flights and its striking rusty plumage during spring migration." Div. of Fisheries & Wildlife, Mass. State Wildlife Action Plan, "Red Knot" (hereinafter "Mass. SWAP Red Knot").[6] Red knots migrate from as far south as the Tierra del Fuego archipelago at the southern tip of South America all the way to their breeding grounds in the Arctic. Below is a photograph of a red knot from the Division of Fisheries & Wildlife website:



Red knot (*Calidris cantus*)

[4] *Available at* https://asmfc.org/wp-content/uploads/2025/01/2013HSC_StockAssessmentUpdate.pdf (last visited Mar. 1, 2026) ("[T]he evidence from New York and New England suggests that current harvest within those regions is not sustainable").

[5] *Available at* https://asmfc.org/wp-content/uploads/2025/01/HorseshoeCrabStockAssessmentUpdate_April2024.pdf (last visited Mar. 1, 2026).

[6] *Available at* https://www.mass.gov/info-details/red-knot (last visited Feb. 23, 2026).

The red knot is listed as threatened under both the federal and Massachusetts Endangered Species Acts. *See* 50 C.F.R. § 17.11; 321 Code Mass. Reg. § 10.90. In Massachusetts, the red knot is also designated as a "Species of Greatest Conservation Need." *See* Mass. SWAP Red Knot. It is a shorebird with one of the steepest—if not *the* steepest—population declines in North America in the last three decades. *See* P.A. Smith et al., *Accelerating declines of North America's shorebirds signal the need for urgent conservation action,* Ornithological Appl. 125:1-14 (2023) (attached as Ex. F). Below is a screen-captured table of population declines in North American shorebirds from Smith et al. (2023):

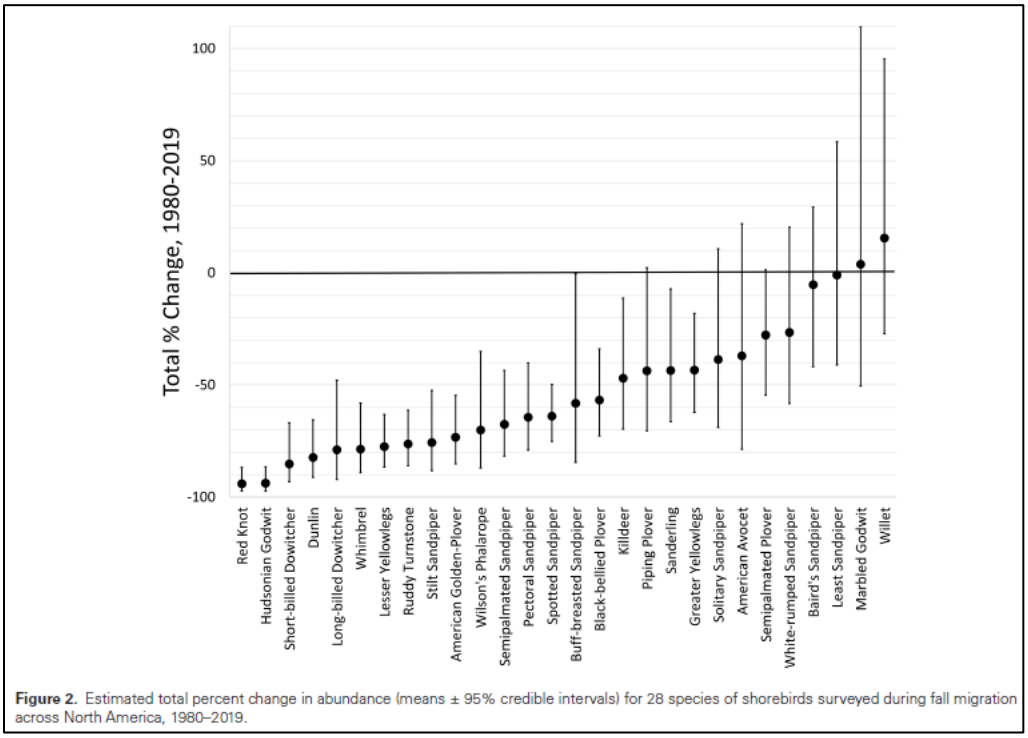


Figure 2. Estimated total percent change in abundance (means ± 95% credible intervals) for 28 species of shorebirds surveyed during fall migration across North America, 1980–2019.

As the Division of Fisheries and Wildlife explains, the red knot "depends on protected coastal stopover sites like those in Massachusetts for survival." *See* Mass. SWAP Red Knot. Massachusetts beaches provide stopover locations for the red knot during both its northern and southern migrations.

Historical records show that enormous numbers of red knots had stopovers in Massachusetts for their northern migration in the spring. A 1912 overview of Massachusetts birds explained:

> Mackay states that before 1850, [red knots] were more numerous at Chatham Nauset, Wellfleet and Billingsgate on Cape Cod, and on the flats around Tuckernuck and Muskeget islands, than in all the rest of New England combined. Their numbers were so large on Cape Cod that estimates were useless. [. . . .] Everybody shot the Knot, in both fall and spring, for it was in demand for the table, brought a good price in the market, decoyed easily, and flew in such flocks that many could be killed at a shot. [. . . .] The ease with which they may be taken will prove their bane unless all spring shooting can be stopped on the Atlantic coast.

Forbush, E.H., *A History of the Game Birds, Wild-fouwl and shore birds of Massachusetts and adacent states (including those used for food which have disappeared since the settlement of the country, and those which are now hunted for food or sport, with observations on their former abundance and recent decrease in numbers; also means for conserving those still in existence.)* at 263-64, 267, Wright & Potter Printing Co. (Boston 1912) (hereinafter "Forbush 1912"). And Massachusetts Audubon relates "a report from a market hunter" in 1850 of "over 25,000 Red Knots on Billingsgate Island." Mass. Audubon, *Horseshoe Crabs and Red Knots—An Old Cape Cod Connection?* (Apr. 28, 2015) (attached as Ex. G) (noting the red knots subsequent decline and its relationship to the decline in horseshoe crabs).

Red knots continue to use Massachusetts as a stopover during their northbound migration, albeit in greatly reduced numbers. According to a 2020 review, the population that uses Tierra del Fuego as a non-breeding location as well as the population that uses the southeast United States and Caribbean for non-breeding locations both include individuals who stopover in Massachusetts while migrating north in the spring. *See* Baker et al., *Birds of the World: Red Knot*, Cornell Lab of Ornithology (Mar. 4, 2020) (citing 1993 and 2012 resighting studies) (attached as Ex. I). And Brad Winn of Manomet observed and photographed red knots in Massachusetts in at least May 2023 and July 2018—estimating 265 red knots in May 2023. *See* Manomet Comment re: American Horseshoe Crab Listing (Jul. 11, 2023) (hereinafter "Manomet MESA Comment") (attached as Ex. H). Below is a photograph of red knots on North Monomoy Island on May 23, 2023, taken from the comment.



Image 6. Part of our 265 Red Knot estimate on North Monomoy. Photo by Brad Winn, Manomet, May23 2023.

Red knots also pass through Massachusetts on their southbound migration in the fall. Third Cliff, Duxbury Beach, and Plymouth Beach on Cape Cod are, in particular, sites where red knots stop en route south. *See* Harrington et al., *Molt and Body Mass of Red Knots in the Eastern*

United States, Wilson J. Ornithology 119:35-42 (Mar. 2007);[7] *see also* Mass. SWAP Red Knot ("Major historical migratory stop-over locations for red knots in Massachusetts include beaches on outer Cape Cod and mainland beaches along West Cape Cod Bay").

Red knots rely on horseshoe crab eggs for survival. *See* Mass. SWAP Red Knot ("The annual horseshoe crab spawning produces a superabundance of eggs, and red knots rely on this food resource prior to their arrival at the breeding grounds"). Shorebirds, including red knots, "historically (Cramer, 2015) and currently exploit horseshoe crab eggs wherever horseshoe crabs spawn on the eastern seaboard (Smith et al., 2019; Takahashi, Sanders & Jodice, 2021)." Smith et al., *Horseshoe crab egg availability for shorebirds in Delaware Bay: Dramatic reduction after unregulated horseshoe crab harvest and limited recovery after 20 years of management*, Aquatic Conserv.: Mar. Freshw. Ecosyst. 2022; 1-13 (attached as Ex. J). The non-government organization Defenders of Wildlife reviewed the scientific literature to explain why horseshoe crab eggs are such a valuable resource for red knots:

> Horseshoe crab eggs are the favored food source for the federally listed red knot and provide the highest energy accumulation rates in the birds worldwide (Piersma et al., 2005). Each knot must consume roughly 400,000 eggs to fuel the second leg of its journey (Cramer, 2018). With breeding season performance, recruitment, and population dynamics correlated to body condition, the birds that fail to acquire such reserves are less likely to survive and reproduce (Dujins et al., 2017). [. . . .] Areas supporting higher densities of horseshoe crabs attract more birds because eggs are likelier to be within their reach (Niles, 2021).

Defenders of Wildlife, *A Call for Intervention: The Decline of South Carolina's Horseshoe Crab Population* (2022) at 5 (hereinafter "Defenders of Wildlife 2022") (attached as Ex. K).

As with elsewhere on the Atlantic coast, red knots have historically exploited horseshoe crab eggs in Massachusetts and continue to do so today. According to the U.S. Fish and Wildlife Service, "documentation of shorebirds feeding on horseshoe crab eggs on Cape Cod dates back to 1881, when red-breasted sandpiper (Red Knot), and turnstones are referenced with respect to foraging on horseshoe crab eggs (Hadgood 1881)." U.S. Fish & Wildlife Serv., *Compatibility Determination for Monomoy Nat'l Wildlife Refuge* at 24 (May 22, 2002) (hereinafter "FWS Compatibility Determination") (attached as Ex. M); *see also* Forbush 1912 (noting red knots "are fond of the spawn of horsefoot crab, which, often in company with the turnstone, they dig out of the sand, sometimes fighting the former birds before the can claim their share"). Red knots feed on horseshoe crab eggs in Massachusetts to this day. *See* FWS Compatibility Determination at 24 (noting that red knot is "present on Monomoy during horseshoe crab spawning periods, or soon enough after spawning that horseshoe crab eggs would be an available food item"); *id.* at 25 ("Evidence of horseshoe crabs in the guts of shorebirds collected on Monomoy NWR confirms visual observations (documented by video camera) that horseshoe crab eggs are a prey item of shorebirds feeding there. This information corroborates documentation from the late 1800s of Red Knots and Ruddy Turnstones feeding on horseshoe crab eggs on Cape Cod."). Moreover, Manomet estimated hundreds of red knots among several shorebird species searching for and

[7] *Available at* https://www.biodiversitylibrary.org/part/240839 (last accessed Mar. 4, 2026).

eating horseshoe crab eggs during the spring 2022 and 2023 stopovers. *See* Manomet MESA Comment.

Because red knots rely on horseshoe crab eggs to sustain their lengthy migration—including long-distance flights over the ocean—Massachusetts Division of Fisheries and Wildlife identifies a central threat to red knot survival as "horseshoe crab overharvesting." *See* Mass. SWAP Red Knot. Red knots are "especially dependent" on horseshoe crab eggs, and "[i]t appears that loss or impaired use of this resource would have major impacts to populations" of shorebirds like the red knot. FWS Compatibility Determination at 23. Studies show that "drastic decrease in horseshoe crab egg abundance . . . corresponds with an equally drastic decline in shorebird populations," especially for the red knot. Smith et al. (2022) at 6; *id*. at 9 ("There is empirical support for stopover population size of shorebirds scaling with prey availability and quality") (citing Witte, 2019); *id*. ("Indeed, it has been established that annual survival of red knots stopping over in Delaware Bay (Dujins et al., 2017) and elsewhere (Morrison, Davidson & Wilson, 2007) is influenced by the relative body condition of the birds during stopover, i.e. their feeding success, rate and quantity of mass gain"); *see also* Kevin Shoemaker, *Review of the Atlantic States Marine Fisheries Commission's (ASMFC) Adaptive Resource Management (ARM) framework for regulating Horseshoe Crab bait harvest in Delaware Bay* at 4-5 (Sept. 2023) (attached as Ex. L) ("My reanalysis of the Delaware Bay mark-resight database indicates that REKN [red knot] survival is strongly and positively influenced by annual fluctuations in HSC [horseshoe crab] egg density"); *see id*. at 19-27 (explaining how "persistent degradation of the HSC [horseshoe crab] egg resource could have dire consequences for the REKN [red knot] population").

In light of the demonstrated connection between horseshoe crab egg supply and red knot survival, as well as the steep decline of the red knot population in general and in Massachusetts in particular, it is no surprise that the U.S. Fish and Wildlife Service found both bait and biomedical harvesting to be incompatible with primary purpose of protecting migratory birds at a stopover site in Massachusetts—Monomoy National Wildlife Refuge. FWS Compatibility Determination at 1; *see id*. at 25-26 ("Over-harvesting horseshoe crabs on Monomoy NWR may result in a decline of available horseshoe crab eggs for migratory shorebirds. This degraded habitat could affect shorebird productivity, survival, and ultimately the total population.").

c. Harvesting horseshoe crabs will reduce the preferred food source for loggerhead sea turtles.

The loggerhead sea turtle, scientific name *Caretta caretta*, is "one of three hard-shelled sea turtles (family Cheloniidae) found regularly in Massachusetts." Div. of Fisheries & Wildlife, Mass. State Wildlife Action Plan, "Loggerhead Sea Turtle" (hereinafter "Mass. SWAP Loggerhead Turtle").[8] They tend to be the largest hard-shelled sea turtles found in Massachusetts, with adults about three feet long and weighing 250 pounds. *Id*.

The loggerhead sea turtle is listed as threatened under both the federal and Massachusetts Endangered Species Acts. *See* 50 C.F.R. § 17.11; 321 Code Mass. Reg. § 10.90. The loggerhead

[8] *Available at* https://www.mass.gov/info-details/loggerhead-sea-turtle (last visited Feb. 23, 2026).

sea turtle is also designated as a "Species of Greatest Conservation Need" in Massachusetts. *See* Mass. SWAP Red Knot.

Loggerhead sea turtles also include horseshoe crabs as part of their diet. *See* FWS Compatibility Determination at 26-27 ("Observations of other fauna feeding on horseshoe crab eggs, hatchlings and adults include: [. . .] loggerhead sea turtles (*Caretta caretta*). All of these species occur on or near Monomoy NWR"); *see also* Defenders of Wildlife 2022 at 5 ("The species is also considered the preferred prey of the loggerhead sea turtle"). Accordingly, reducing horseshoe crabs through bait and biomedical harvesting will deplete a food source and force loggerhead turtles to search for other types of food, including in traps and nets that can harm them. *See id.* (explaining how "management of [horseshoe crab] stock directly tied to alterations in loggerhead foraging patterns," including "scavenging on net-entangled or discarded fish") (citing Seney & Musick, *Historical diet analysis of loggerhead sea turtles (Caretta Caretta) in Virginia*, Copeia 2007:478-489 (2007)). For example, the drop in horseshoe crab and blue crab populations in the Chesapeake Bay "may also correlate to the overall decrease in the number of sea turtles in the Chesapeake Bay over the past few decades." Krisfalusi-Gannon et al., *The Role of Horseshoe Crabs in the Biomedical Industry and Recent Trends Impacting Species Sustainability*, Frontiers in Marine Science 5:185 (June 2018) (attached as Ex. N) (citing M. Botton, *The ecological importance of horseshoe crabs in estuarine and coastal communities: a review and speculative summary,* in Biology and Conservation of Horseshoe Crabs at 45-64 (Tanacredy et al. eds.) (2009)).

IV. Massachusetts Division of Marine Fisheries Must Comply with the Massachusetts Endangered Species Act.

The Division of Marine Fisheries first needs to comply with Massachusetts Endangered Species Act before altering its quotas for the harvest of horseshoe crabs. It must seek review from the Division of Fisheries and Wildlife to evaluate whether the increased quota will "take" State-listed species. Because horseshoe crab harvesting pursuant to the increased quota will result in take of State-listed red knots and loggerhead turtles, DMF should alter its proposal and use all practicable means and measures to avoid take and other damage to those State-listed species and their habitats.

a. Massachusetts Endangered Species Act legal framework.

Under the Massachusetts Endangered Species Act, all state agencies—including DMF—must "review, evaluate and determine the impact on Endangered, Threatened and Special Concern species or their habitats of all works, projects or activities conducted by them; and use all practicable means and measures to avoid or minimize damage to such species or their habitats." 321 Code Mass. Reg. § 10.05(1). State agencies have experience undertaking substantive regulatory changes to crab harvesting to ensure protections for state-listed species. For example, DMF prohibits all blue crab trappers from using common hard-backed crab traps for the purpose of protecting MESA-listed threatened northern diamond-backed terrapins. *See* 322 Code Mass. Reg. § 6.19(10) (describing "Prohibitions on the Taking of Blue Crabs"); *see also* Div. Marine Fisheries, MA Marine Fisheries Advisory Commission Mar. 18, 2021, Meeting

Summary at 2 ("This prohibition is being implemented to prevent the incidental catch of diamondback terrapin turtles in blue crab traps.").[9]

A state action is compliant with 321 Code Mass. Reg. § 10.05(1) if either: (a) it has received relevant MESA permits, (b) it has been reviewed under MEPA and has satisfied the Secretary of the Executive Office of Energy and Environmental Affairs (the "Secretary") that it has complied with all MEPA processes and substantive requirements; or (c) is in conformance with a management plan developed in consultation with the Natural Heritage and Endangered Species Program ("NHESP") with specific MESA inventory and planning procedures and management policies. *Id*. § 10.05(2).

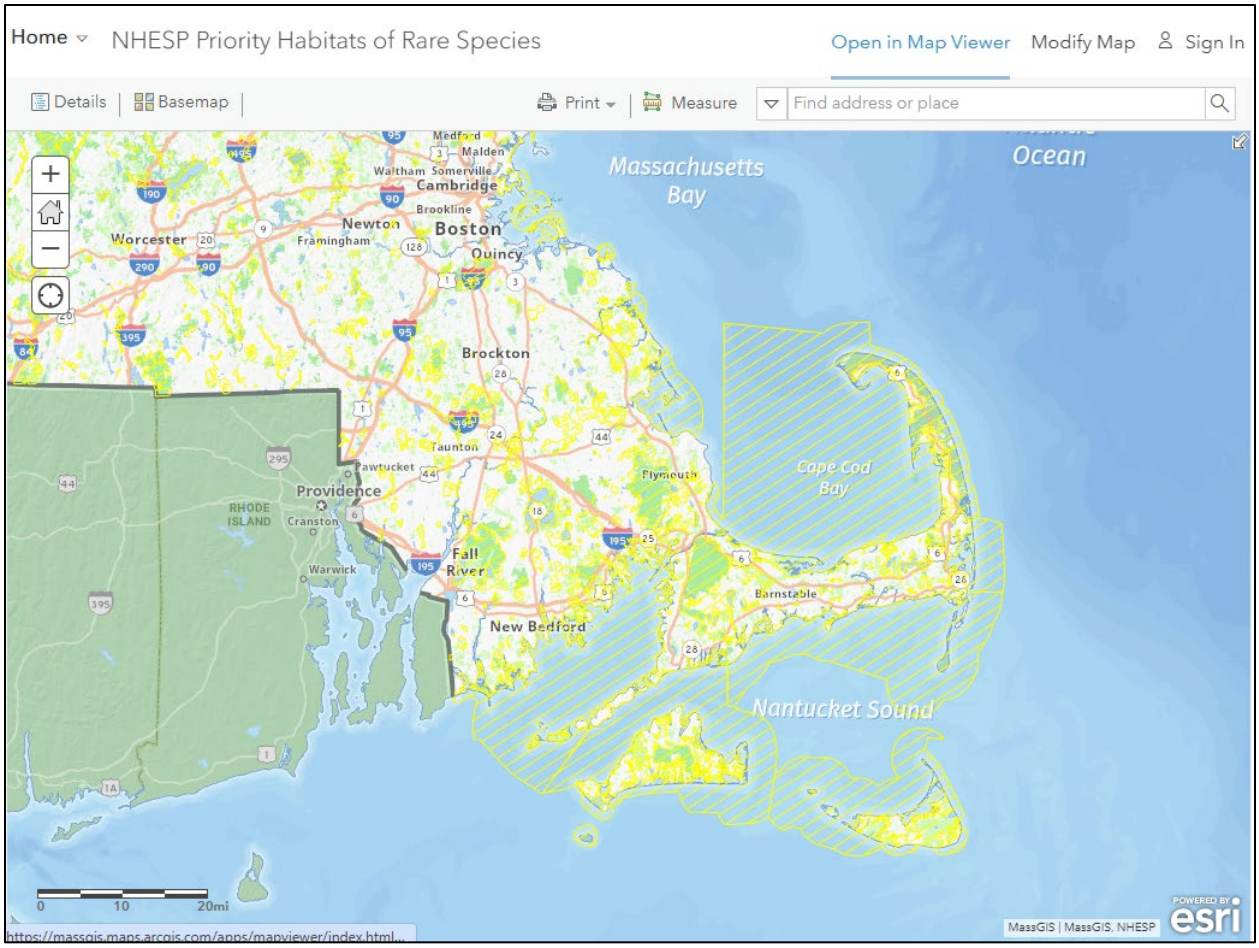
Moreover, under MESA regulations, "any Project or Activity that will be located or will take place in Priority Habitat shall be reviewed by the Division [of Fisheries and Wildlife] as provided in this section *prior to commencement of any physical work or action in Priority Habitat*." 321 Code Mass. Reg. § 10.18(1) (emphasis added). DMF's quota increase is a "Project or Activity," which the MESA regulations define expansively. *Id*. §§ 10.02 (throughout "321 CMR 10.00, the following words or phrases shall have the following meanings: . . . . Project or Activity means *any action*, including, but not limited to . . .") (emphasis added), 10.05 ("projects" undertaken by third parties "which require[] the issuance of permit by an agency" are "state actions," and "'activities' means any acts carried out by a state agency which could affect a state listed species or their habitats"). In its review, the Division of Fisheries and Wildlife must determine "if a Take will result from any temporary or permanent modification, degradation or destruction of Priority Habitat occurring as a result of the proposed Project or Activity." *Id.* § 10.18(1).[10] The action may only proceed if it "has avoided a Take as proposed, or with conditions"; however, if it "will result in a Take [it] cannot proceed as proposed." *Id.* § 10.18(2). In short, if an action occurs in Priority Habitat, the Division of Fisheries and Wildlife must first review it to ensure that it avoids Take.

"Priority Habitat" is "the geographic extent of Habitat for State-listed Species," which is "based on records of State-listed Species observed within the 25 years prior to delineation and contained in the Division's NHESP database." *Id.* § 10.02. "Habitat" is further defined as an area which "protects or provides important elements for the growth and survival of plants or animals such as food, shelter, or living space, and includes without limitation, breeding, feeding, resting, migratory, or overwintering areas." *Id*. NHESP has created a map of Priority Habitat for all of Massachusetts:

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[9] *Available at* https://www.mass.gov/doc/march-18-2021-mfac-business-meeting-summary/download (last visited Feb. 22, 2026).

[10] The "Take" of an animal is "to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity" of the animal, or to "attempt to engage in any such conduct, or to assist such conduct." 321 Code Mass. Regs. § 10.02.



See https://www.mass.gov/info-details/massgis-data-nhesp-priority-habitats-of-rare-species (last visited Feb. 19, 2026).

b. The increased quota decision does not consider impacts on State-listed red knots and loggerhead turtles or their habitats, let alone "use all practicable means and measures to avoid or minimize damage" to them.

The Division of Marine Fisheries' increased quota of harvested horseshoe crabs would be a state action subject to MESA. DMF must "review, evaluate and determine the impact on Endangered, Threatened and Special Concern species or their habitats" from the quota. 321 Code Mass. Reg. § 10.05(1). DMF must also "use all practicable means and measures to avoid or minimize damage to such species or their habitats." *Id*. MESA regulations define "habitat" to be an area which provides elements for the survival of animals "such as food" and "includes without limitation, . . . feeding, resting, migratory, or overwintering areas." *Id*. § 10.02.

As described above, horseshoe crabs and their eggs are inextricably linked to state-listed red knots and loggerhead sea turtles. The increased harvesting and killing of horseshoe crabs—and its attendant interference with horseshoe crab spawning—will reduce an important food source, thus "impacting" red knot and loggerhead sea turtle "habitat" as well as the red knot and loggerhead sea turtle species at both the individual and population levels. *See* Section III, *supra*.

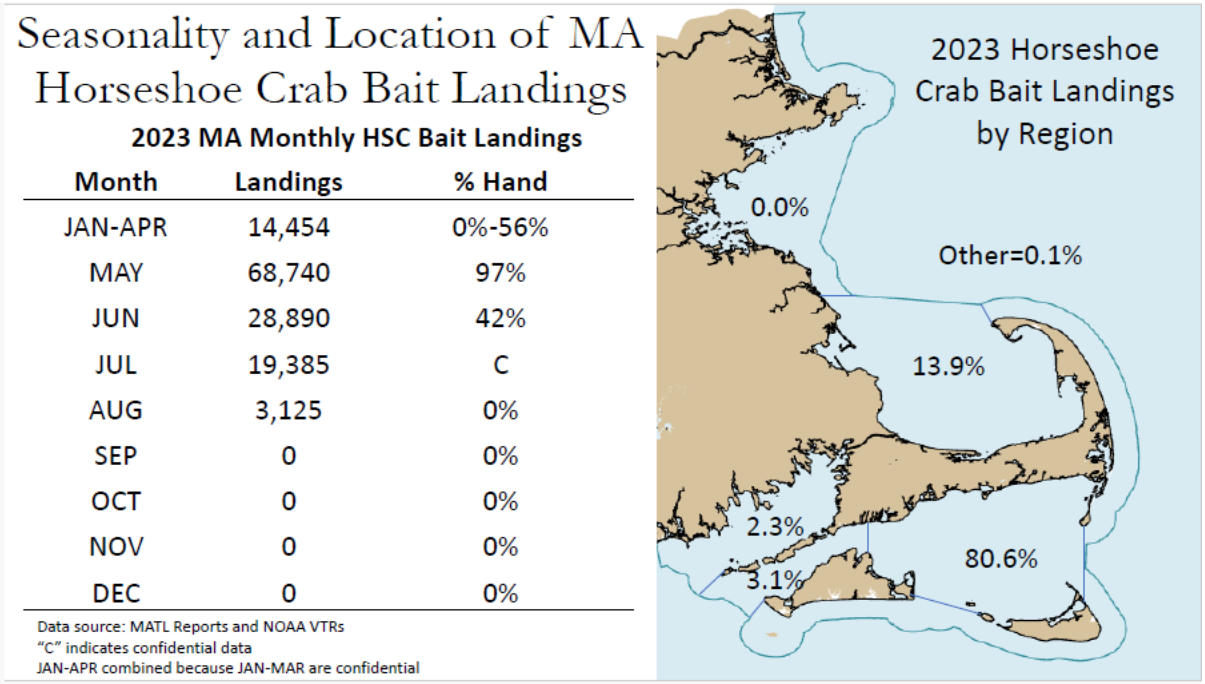
Accordingly, DMF must "review, evaluate, and determine the impact" of the increased quota on red knots and loggerhead sea turtles and their habitats. *See* 321 Code Mass. Reg. § 10.05(1).

There is no evidence in its decision documents that DMF has even contemplated—let alone "review[ed], evaluate[d], and determine[d] the impact" of—the horseshoe crab harvest quota on state-listed species. *See generally* Dec. 2025 McKiernan Memo (zero references to red knots or loggerhead sea turtles); Feb. 23, 2026, Div. of Marine Fisheries Notice of Public Hearing and Comment Period (same) (attached as Ex. O) *see also* 322 Code Mass. Reg. § 6.34 (same). Nor is there evidence that DMF has undertaken any of the pathways identified in 321 Code Mass. Reg. § 10.05(2). The agency must do so before authorizing the increased harvest quota. In addition, after reviewing and determining the quota's impacts, DMF must comply with MESA by using all "practicable means and measures to avoid or minimize damage" to red knots and loggerhead sea turtles and their habitats. *See* 321 Code Mass. Reg. § 10.05(1).

c. Horseshoe crab harvesting authorized by the increased quota will occur in Priority Habitat and will Take State-listed red knots and loggerhead turtles.

The Division of Marine Fisheries' authorization of increased horseshoe crab harvesting is also a "Project or Activity that will be located or will take place in Priority Habitat." 321 Code Mass. Reg. § 10.18(1). Accordingly, it must first be "reviewed" by the Division of Fisheries and Wildlife "prior to commencement of any physical work or action in Priority Habitat." *Id*.

The authorized harvesting occurs both via hand collection on beaches or shallow water and via trawling by boat. "The bait fishery for horseshoe crabs principally occurs south and west of Cape Cod with Nantucket Sound being the primary harvest area." Dec. 14, 2023, Memorandum from Daniel McKiernan re: Proposal Affecting Horseshoe Crab Management at 2 (attached as Ex. P). "The biomedical fishery is similarly focused south and west of Cape Cod. However, Pleasant Bay—along the Outer Cape—has been an important site for the collection of biomedical crabs for nearly 50 years and has been closed to bait harvest since 2006." *Id*.; *see* Dec. 2025 McKiernan Memo at 2 n.2 ("Note that biomedical harvest is primarily occurring within the northeast portion of Nantucket Sound by mobile gear vessels. Fishery participants have expressed concern to DMF that there may be an over-reliance on this small area."). A visual depiction of the locations for harvest activities is below:



Slide screenshot taken from Derek Perry presentation on March 14, 2025.

Comparing these harvest areas with the NHESP Priority Habitat map depicted above, *see* Section IV.a, *supra*, it is clear beyond cavil that the authorized increased horseshoe crab harvesting "will take place in Priority Habitat." 321 Code Mass. Reg. § 10.18(1). This makes sense, because "Priority Habitats are delineated based on records of State-listed Species observed within the 25 years prior to delineation," and state-listed species that feed on horseshoe crabs and their eggs would naturally be observed where they feed on horseshoe crabs. *See id*. § 10.02.

Because the authorized activities from the increased quota will occur in Priority Habitat, the Division of Fisheries and Wildlife must review DMF's proposal to determine whether DMF has "demonstrate[d] that the proposed Project or Activity does not result in a Take." *Id*. §§ 10.18-.19. Under the current proposal, DMF will be wholly unable to demonstrate that the increased quota will not take state-listed red knots and loggerhead sea turtles. MESA regulations define "Take" to include disrupting the "feeding or migratory activity" of a species, which can result from "the modification, degradation or destruction of Habitat." *Id.* § 10.02.[11] Here, the increased quota proposal depletes an important food source for red knots and loggerhead sea turtles which, by definition, will disrupt the feeding or migratory activity of the species. *See* Section III, *supra.*

DMF's proposal to increase the harvest of horseshoe crabs "will result in a Take and cannot proceed as proposed." 321 Code Mass. Reg. § 10.18(2)(b). The agency should consult

[11] *See Douglas Envtl. Assoc. v. Dep't of Envtl. Prot.*, 429 Mass. 71, 74 (1999) (noting that Massachusetts concluded an activity "would disturb the upland feeding and migratory habits of the marbled salamander and thus would constitute a 'taking' of the salamanders in violation of MESA, G.L. c. 131A, § 2"); *cf. Greenpeace Found. v. Mineta*, 122 F. Supp. 2d 1123 (D. Haw. 2000) (enjoining operation of lobster fishery in Hawaii under the federal ESA because the fishery was depleting the critically endangered monk seal's food source).

with the Division of Fisheries and Wildlife to discuss alternatives to the proposal "that may avoid a Take." *Id*. § 10.18(3). In the final section at the end of these comments, we propose alternatives to the increased quota proposal that would avoid "take."

V. Massachusetts Department of Marine Fisheries Must Comply with the Massachusetts Environmental Policy Act.

The Division of Marine Fisheries also needs to comply with Massachusetts Environmental Policy Act before increasing its quota for the harvest of horseshoe crabs. Because multiple MEPA thresholds apply to the proposed quota increase, DMF must first at least prepare and disseminate an Environmental Notification Form—and likely an Environmental Impact Report—for comprehensive MEPA review.

DMF has not yet initiated the MEPA process by preparing an ENF and disseminating it for public notice.[12]

a. Massachusetts Environmental Policy Act legal framework.

As with MESA, MEPA and its implementing regulations impose both general and specific responsibilities on state agencies like DMF. At a general level, an agency "shall periodically review and evaluate its own programs, regulations, and policies and determine the potential environmental impacts of its implementation of its programs, regulations and policies"—including assuring its compliance with MEPA. 301 Code Mass. Reg. § 11.12(1).

More specifically, MEPA "directs that an agency, before taking action on a project, make substantive findings describing the impact, if any, of the project and certifying that all feasible measures have been taken to avoid or minimize said impact." *Enos v. Sec. of Envtl. Affairs*, 432 Mass. 132, 136 (2000) (quoting M.G.L. c.30 § 61). Agency actions governed by MEPA include "projects" undertaken by third parties that require one or more "permits" from state agencies, *id.*; the statute broadly defines "project" to include any "work, project, or activity" and "permit" to include, *inter alia*, a "license, permit, . . . approval or other entitlement for use." M.G.L. c.30 § 62. A quota authorizing crab harvesters a maximum amount of harvesting and killing of horseshoe crabs—within which DMF issues "permits" to carry out the harvesting and killing, *see* 322 Code Mass. Reg. § 6.34 (requiring permits for both biomedical and commercial fishers of horseshoe crabs)—plainly falls within MEPA's sweeping definition of agency action.

An agency action must undergo MEPA review if the action meets or exceeds one or more "review thresholds." *Id.* § 11.01(2). MEPA review thresholds "identify categories of Projects or

[12] A search of the "Energy & Environmental Affairs MEPA Database" shows only one project for any level of MEPA review between December 1, 2025, and February 25, 2026, that identifies DMF as the relevant agency. *See* https://eeaonline.eea.state.ma.us/EEA/MEPA-eMonitor/search (last visited Feb. 25, 2026). The Center for Biological Diversity also submitted on February 10, 2026, a public records request seeking all MEPA and MESA review records associated with this horseshoe crab harvest quota proposal; on March 3, DMF stated it had "no responsive records" concerning MEPA and MESA review of the December 12, 2025, horseshoe crab harvest quota proposal. *See* Mar. 3, 2026, DMF Letter to Ann Brown, Ctr. for Biological Diversity (attached as Ex. S).

aspects thereof of a nature, size or location that are likely, directly or indirectly, to cause Damage to the Environment"—these thresholds "determine whether MEPA review is required." 301 Code Mass. Reg. § 11.03. MEPA regulations lay out several categories of review thresholds, and at least two are relevant here: the requirement to prepare at least an Environmental Notification Form ("ENF") when (i) there are harms to state-listed endangered or threatened species or species of special concern,[13] or (ii) an agency revises certain regulations that significantly reduce standards environmental standards.[14] If these thresholds are triggered, the agency proponent must file an ENF "to advise the Secretary of the nature of the project." *Enos*, 432 Mass. at 136; *see* 301 Code Mass. Reg. § 11.05. After at least a thirty-day review period, "during which the Secretary consults with the agency and other interested parties," the Secretary determines whether an Environmental Impact Report ("EIR") is required. *Enos*, 432 Mass. at 136; *see* 301 Code Mass. Reg. § 11.06. Both the ENF and EIR preparation and review processes drive agency decision-making towards undertaking "feasible measures" to avoid or mitigate harm to the environment. *Id.* §§ 11.07, 11.08, 11.12.

b. The increased horseshoe crab quota crosses a "review threshold" requiring an Environmental Notification Form because it will harm state-listed threatened species.

As explained above, an increase to the harvest quota for horseshoe crabs is an agency action under MEPA. Here, the MEPA regulations require DMF to prepare an ENF because the harvesting will lead to "[g]reater than two acres of disturbance of designated priority habitat," and because that disturbance will cause "take of state-listed endangered or threatened species." *See* 301 Code Mass. Reg. § 11.03(2)(b)(2). The authorized horseshoe crab harvesting will occur along beaches, in shallow water, and in deeper coastal water south and west of Cape Cod and along the Outer Cape, disturbing Priority Habitats for state-listed red knots and loggerhead sea turtles in areas totaling far more than two acres. *See* Section IV, *supra*. And that disturbance will remove horseshoe crabs and their eggs, depleting a critical food source for red knots and loggerhead sea turtles and interfering with their feeding and migratory behaviors, thus "taking" and otherwise harming the state-listed species. *See id*.

c. The increased horseshoe crab quota crosses a "review threshold" requiring an Environmental Notification Form because it will undermine a regulation that aims to protect the environment.

The Division of Marine Fisheries must also prepare an ENF because an increased harvesting quota is "revised regulation" of the horseshoe crab management program, "of which a

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[13] The regulations require "ENF and Other MEPA Review if the Secretary So Requires" when there is "Greater than two acres of disturbance of designated priority habitat, as defined in [MESA regulations], that results in a take of state-listed endangered or threatened species or species of special concern." 301 Code Mass. Reg. § 11.03(2)(b)(2).

[14] The regulations also require "ENF and Other MEPA Review if the Secretary So Requires" for the "Promulgation of New or revised regulations, of which a primary purpose is protecting against Damage to the Environment, that significantly reduce: (a) standards for environmental protection . . . ." 301 Code Mass. Reg. § 11.03(12)(b)(1).

primary purpose is protecting against Damage to the Environment"—yet the quota revisions will "significantly reduce [] standards for environmental protection." *See* 301 Code Mass. Reg. § 11.03(12)(b)(1). The horseshoe crab management regulations have an express purpose "to ensure the resource is available for current and future generations" for many human uses, "*and to provide cultural and ecological services*." 322 Code Mass. Reg. § 6.34(1) (emphasis added). The purpose "requires the Division of Marine Fisheries control harvest and mortality across all fisheries and provide for spawning opportunities." *Id*.

Contrary to the primary environmental protection purpose behind its regulatory assignment of managing horseshoe crabs, DMF is increasing the harvest quota for a species that is nowhere close to recovered. *See* Section III.a, *supra*. The revised quota will lead to more horseshoe crab harvesting, killing, bleeding, and spawning interference. *See* Section II, *supra*. This will, in turn, reduce the number of horseshoe crabs and their eggs, which will deplete an important food resource for other species and undercut the horseshoe crabs' ecological services. *See* Section III.b-.c, *supra*.

* * * *

DMF's proposal to increase the horseshoe crab harvest is an activity that crosses at least two thresholds for DMF to prepare an ENF. DMF must at a minimum "circulate copies of the [prepared] ENF" and "publish a Public Notice of Environmental Review," then "file it with the Secretary," *see* 301 Code Mass. Reg. § 11.05(1), to allow for "timely . . . analysis of alternatives, consideration of cumulative environmental impacts, and providing meaningful opportunities for public review," *id*. § 11.05(2). As part of the MEPA review, both DMF and the Secretary must identify feasible alternatives that will avoid environmental impacts. We propose such feasible alternatives in the section below.

VI. Division of Marine Fisheries Must Follow Massachusetts Endangered Species Act and Environmental Policy Act Processes and Undertake Feasible and Practicable Measures to Protect Horseshoe Crabs and Species Relying on Them.

The proposal to increase the horseshoe crab harvest risks further damage to a struggling horseshoe crab population, with related harm to federal- and state-listed species that are in steep decline.[15] Rather than exacerbate the threats to horseshoe crabs, shorebirds (including the threatened red knot), and marine species (including the threatened loggerhead sea turtle), DMF should use this regulatory process as an opportunity to consult with other experts inside and outside the government on horseshoe crabs and their role in the ecosystem. DMF should also undertake means and measures to bolster the horseshoe crab and the species that rely on it.

[15] For the reasons explained above, we believe that the proposed quota alterations will increase the harvesting, killing, and reproductive interference above the currently existing quota regulations. But even if it will not, the proposed quota will significantly damage state-listed species and the environment as compared to the baseline of zero horseshoe crab harvesting. Accordingly, DMF must comply with MESA and MEPA regardless of whether the proposed quota alterations ultimately increase the killing of horseshoe crabs above the current harvest reality.

- **Do not revise the authorized quota until all statutory processes are complete.** As detailed above, to comply with MESA and MEPA, DMF must first consult with necessary government actors (e.g., Division of Fisheries and Wildlife, Secretary of Energy and Environmental Affairs) before revising its regulations setting the horseshoe crab quotas.

- **Undertake practicable and feasible alternatives to an increased quota.** MESA demands that agencies use "practicable means and measures" to avoid damage to state-listed species, and MEPA demands that agencies identify "feasible alternatives" that will avoid environmental impacts. We propose the following actions to achieve these goals:

    - ***Eliminate the bait harvest***. The horseshoe crab bait harvest is intended to supply bait for the eel and whelk (or "conch") fishery. The eel fishery appears to be nonexistent, and the whelk fishery has so drastically declined that in 2024 the largest bait dealer sold all 59,909 bait crabs it acquired at $0.50 per crab and offered $0.25 per crab in 2025. *See* Aug. 8, 2025, Shellfish Broker Letter (attached as Ex. Q) ("In our opinion, this indicates systemic overcapacity in the bait quota . . ."). Indeed, that bait dealer appeared to make all its money through the Rent-a-Crab program, showing that the bait harvest is a stalking horse for biomedical bleeding sales. *See id.* (explaining its "100% Rent-a-Crab participation").[16] Using DMF's expectation that "current local bait crab demand approximates 75,000 – 90,000 horseshoe crabs annually," Dec. 2025 McKiernan Memo at 1, sales at $0.25 per crab means that bait dealers' *total revenue* from the bait industry is a meager $18,750 – $22,500—and profit would be even less.

      Moreover, eliminating the bait harvest would have no effect on a remnant whelk fishery, if one exists. Researchers in New England recently found that an alternative bait made from parts of invasive green crabs and clams "resulted in greater whelk interaction" than bait from horseshoe crabs.[17]

      In short, eliminating the bait harvest would significantly reduce the killing of horseshoe crabs in Massachusetts—thus generating many ecosystem benefits—without any effect on a minor-to-nonexistent fishing industry.

    - ***Phase out the biomedical bleeding harvest.*** Rather than increase the biomedical bleeding harvest, DMF should gradually decrease the harvest toward an eventual phase out. Experience shows this is feasible and practicable—harvesting horseshoe crabs for biomedical bleeding purposes is currently prohibited in Connecticut and phasing out in New York. *See* Conn. House Bill No. 6484, Public Act No. 26-3 (effective Oct. 1, 2023); N.Y. C.L.S. Envtl. Conserv. L. § 13-0331.

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[16] *See also* Dec. 2025 McKiernan Memo at 4 ("I am skeptical that the [whelk] fishery will soon return to prior peak levels – not just because of market conditions – but because the resource is depleted throughout its range within Massachusetts waters, as evidenced by a lack of larger whelk in the observed catches.").

[17] Munley et al. *Laboratory investigations into alternative baits for the channeled whelk* (Busycotypus canaliculatus) *fishery*, Fisheries Research 271 (2024) 106920 (attached as Ex. R).

Both states have banned the harvest for biomedical bleeding because horseshoe crab blood is no longer necessary for endotoxin testing. Standards-setting body U.S. Pharmacopeia set industry standards for synthetic endotoxin test methods,[18] Congress recently directed the U.S. Food and Drug Administration to update its guidance to accept synthetic endotoxin testing in the manufacturing of new and existing products, and large biomedical companies like Eli Lilly are making the transition to synthetic.[19] If Connecticut and New York find it feasible and practicable to phase out the horseshoe crab biomedical bleeding harvest, so should Massachusetts.

Thank you very much for the opportunity to share our views and for your consideration of this comment. We look forward to DMF taking appropriate steps to protect species and their habitats when revising the horseshoe crab harvest quotas.

Respectfully,

/s/ Daniel H. Waltz

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AMERICAN BIRD CONSERVANCY

[18] *See* U.S. Pharmacopeia, "Expert Committee approves endotoxin testing using non-animal derived reagents," Jul. 26, 2024, *at* https://www.usp.org/news/expert-committee-approves-endotoxin-testing-using-non-animal-derived-reagents (last visited Feb. 25, 2026).

[19] *See* Kate Selig, *Massachusetts wants to bleed more horseshoe crabs for medical testing. Can a cruelty-free method prevail?*, Boston Globe, Feb. 10, 2026, *at* https://www.bostonglobe.com/2026/02/10/science/horseshoe-crab-marine-fisheries-biomedical-industry/ (last visited Feb. 25, 2026).

Exhibit A

The Commonwealth of Massachusetts
Division of Marine Fisheries
(617) 626-1520 | www.mass.gov/marinefisheries

MAURA T. HEALEY, Governor | KIMBERLEY DRISCOLL, Lt. Governor | REBECCA L. TEPPER, Secretary | THOMAS O'SHEA, Commissioner | DANIEL J. MCKIERNAN, Director

MEMORANDUM

TO: Marine Fisheries Advisory Commission (MFAC)

FROM: Daniel J. McKiernan, Director

DATE: December 12, 2025

SUBJECT: Public Hearing Proposal on Horseshoe Crab Quota Management

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Proposal

This memo serves to inform the MFAC that I intend to go out to public hearing later this winter to reduce the bait crab quota from 140,000 crabs to 100,000 crabs and reallocate these 40,000 crabs to the biomedical sector at a 1:2 ratio thereby increasing the biomedical quota from 200,000 crabs to 280,000 crabs.

Rationale

This proposal responds to increasing demand for horseshoe crabs from the biomedical sector coupled with decreasing effort in the state's conch pot fishery reducing the local demand for bait crabs. These dynamics have produced a situation whereby biomedical demand is driving bait harvest through the rent-a-crab program even when there is limited concurrent demand for bait crabs. This speaks to a misalignment in the quantity of horseshoe crabs allocated to each fishery that may be corrected by transferring quota between the sectors to better match demand. Further, this action will reduce overall mortality to the horseshoe crab stock.

DMF has analyzed effort trends in the state's conch pot fishery (Figure 1) and determined that the current local bait crab demand approximates 75,000 – 90,000 horseshoe crabs annually. Accordingly, reducing the bait quota from 140,000 crabs to 100,000 crabs will provide a more than sufficient supply of crabs for the state's conch pot fishery. Given the poor status of the channeled whelk resource in Massachusetts, DMF does not anticipate the conch pot fishery will rebound to prior peak effort levels (e.g., 2012), but it is conceivable this fishery could nominally rebound should market conditions improve and the proposed quota would provide bait at levels sufficient to meet such demand. See section below titled "Overview of the Conch Pot Fishery" for more information.

The 40,000 horseshoe crabs taken off the bait quota will be reallocated to the biomedical fishery at a ratio of 1:2. This will result in the biomedical quota increasing from 200,000 horseshoe crabs annually to 280,000 horseshoe crabs annually — a net increase of 40,000 horseshoe crabs potentially available to the biomedical industry[1]. When developing the biomedical quota in 2023, DMF used a 1:6 ratio when reallocating bait quota for biomedical purposes. This conversion factor was based on the estimated 15% mortality rate for the biomedical fishery. At present, I propose using the more conservative 1:2 conversion factor because there remains some uncertainty around the recapture[2] of these animals and the sublethal impacts of biomedical processing on horseshoe crabs. Finally, there is an undeniably strong public interest in managing horseshoe crabs for abundance, and if DMF is going to increase overall harvest, then it should be done in a manner that will not increase overall mortality. In this instance, the proposal will actually reduce overall mortality by about 28,000 crabs annually, assuming a 15% biomedical mortality rate.

DMF has heard from industry on a variety of potential alternative or additional management changes for 2026 and have spent the last several months engaging stakeholders in the interest of due diligence. Ultimately, I have decided to move forward to rulemaking with only the most straightforward option — the proposed quota reallocation — as it is the simplest way to address current market misalignment, is beneficial to conservation, and provides the various industries involved in the horseshoe crab fishery with the greatest amount of certainty for expectations in 2026. I worry that trying to address too many concerns or taking increasingly novel approaches to management will ultimately create additional issues. Instead, my preference is to make this single change and analyze its performance and then consider additional or alternative approaches only if warranted. See section titled “Additional Considerations” for more details.

Background

Development of Biomedical Quota

In 2023, DMF established a first ever biomedical horseshoe crab quota of 200,000 horseshoe crabs annually to be split evenly among permitted biomedical processors. This was done in response to concerns about increasing horseshoe crab mortality driven by growing biomedical demand in Massachusetts. The adoption of this quota effectively allowed DMF to cap overall mortality at 2022 levels, which the available data suggests would allow horseshoe crab abundance to continue to increase. Since the adoption of the biomedical quota, DMF has

[1] At present, the biomedical industry has access to 340,000 horseshoe crabs annually through the 200,000 crab biomedical quota, as well as the 140,000 crab bait quota through the rent-a-crab program. The proposed adjustment would provide the biomedical industry access to 380,000 horseshoe crabs through a 280,000 crab biomedical quota and a 100,000 crab bait quota.

[2] Note that biomedical harvest is primarily occurring within the northeastern portion of Nantucket Sound by mobile gear vessels. Fishery participants have expressed concern to DMF that there may be an over-reliance on this small area. As the biomedical crabs are released alive and are marked to identify it as a bled crab in season, future at-sea monitoring to determine the recapture of bled crabs would tell us if removals from this area become excessive.

received persistent comments from biomedical processors, dealers, and fishers requesting DMF increase the biomedical quota.

Demand for Horseshoe Crabs as Bait

Horseshoe crabs are the preferred bait in the conch pot fishery. Therefore, bait demand is a function of bait use per pot haul. DMF's understanding is that conch pot fishers generally mix between one-quarter and one-third of a horseshoe crab[3] with other bait per pot haul. Accordingly, with the state's conch pot fishery conducting fewer than 300,000 pot hauls annually since 2020 (Figure 1), DMF estimates the bait need for this fishery to be in the range of 75,000 to 90,000 horseshoe crabs annually.

This level of estimated bait demand is substantially lower than the current bait quota of 140,000 horseshoe crabs. Despite this, Massachusetts' routinely approaches fully utilizing its horseshoe crab bait quota (Table 1). This is occurring because biomedical demand for these crabs —through the rent-a-crab program — is driving bait harvest. As a result, DMF is receiving reports that crabs harvested against the bait quota often do not have a viable bait market and several whelk processors who provide bait to their conch pot fishers already have an ample quantity of horseshoe crabs in frozen storage. This speaks to a misalignment that could be remedied through a reduced bait quota and enhanced biomedical quota.

Overview of Conch Pot Fishery Performance

Effort in the conch pot fishery increased in the mid 2000s — in response to environmental related declines in the abundance of Southern New England lobster and displacement from the that fishery — before peaking at about 600,000 pot hauls annually in 2012 (Figure 1). Effort has steadily declined since then and for the past six years (2019-2024) it has been at or below 300,000 pot hauls annually[4]. This decline is likely driven by several factors — reduced abundance of channeled whelk, regulations to raise the size-at-harvest to protect spawning stock biomass, and more recently, unstable domestic and international market conditions.

Even within the context of this recent period of reduced productivity, 2024 was an extremely challenging year for the conch pot fishery (Table 2). Market conditions constrained effort and landings and our fishery conducted just over 200,000 pot hauls and the fishery landed only about 700,000 pounds of channeled whelk valued at about $2M. While market conditions reportedly remain tenuous, 2025 landings data suggest the fishery has nominally rebounded. As of December 11, 2025 almost 820,000 pounds of channeled whelk have been landed this year with an ex-vessel value of nearly $2.6 million. Assuming fairly static catch per unit effort this year compared to the past five years, DMF estimates the fishery will likely conduct about 250,000 pot hauls in 2025.

[3] The amount of horseshoe crab used per pot haul is generally dictated by the size of the horseshoe crab. This is informed by a 2015 DMF survey, observations of bait use while sea sampling, and informal conservations with bait dealers and conch pot fishers.

[4] 300,000 trap hauls annually is also consistent with where effort was in this fishery prior to the spike in the mid-2000s.

There is some tempered optimism among whelk dealers and processors that the market can support 2025-levels of effort and landings moving forward. However, I am skeptical that the fishery will soon return to prior peak levels — not just because of market conditions — but because the resource is depleted throughout its range within Massachusetts waters, as evidenced by a lack of larger whelk in the observed catches. Accordingly, I anticipate the conch pot fishery will continue to operate around (and more likely below) 300,000 pot hauls annually for the foreseeable future. The bait demand for this level of activity will be sufficiently met by the proposed quota, notwithstanding any improvements in the development and availability of alternative bait sources that may further reduce bait demand moving forward.

Additional Considerations

As a matter of routine due diligence, DMF networks with stakeholders to inform the development of regulatory proposals. This fall, DMF heard extensive concerns regarding a variety of issues related to the performance of the horseshoe crab fishery and the bait market. I do not intend to address these concerns and frustrations through regulatory actions at this time. However, I do want to acknowledge these issues to benefit of the MFAC's deliberation on this subject.

<u>Eliminating the Rent-A-Crab Program</u>

It has been suggested that DMF should prohibit the rent-a-crab program. Proponents argue this program has evolved beyond its intended function (i.e., use crabs harvested as bait for biomedical purposes) and is now driving bait harvest and warping the relationship between bait demand and bait harvest. This is further complicated by the fact that the rent-a-crab program is primarily pursued during the early summer months[5] — a time of year when the conch pot fishery is less active. This creates a further disconnect between bait harvest and bait demand and results in product being placed in frozen storage.

I support the continuation of the rent-a-crab program as it allows nearly all Massachusetts bait crab harvest to be repurposed for biomedical use thereby supplementing biomedical demand and optimizing the utility of each crab harvested. Eliminating this program would be wasteful and would likely also increase demand for additional biomedical quota. Further, biomedical demand has elevated the ex-vessel value of horseshoe crabs to the benefit of all bait fishers. If this value were to be lost, vessels may not target horseshoe crabs for bait purposes thereby reducing the overall supply of horseshoe crabs to market. Reduced profitability may lead to vessels leaving inshore mobile gear fisheries impacting the supply of other locally caught fish (e.g., squid, summer flounder, black sea bass, scup, quahogs).

[5] DMF has observed that it is common for inshore draggers to pursue the bait quota during the summer months when other profitable species like summer flounder are targeted on the same trip. This allows these boats to make profitable trips combining their summer flounder limit with the 300 horseshoe crabs bait fishery trip limit. Then in the fall, when summer flounder migrate out of the Sounds, some draggers switch over to target the biomedical horseshoe crab quota at the higher 1,000 crab biomedical trip limit.

Constraining Commercial Fisher Access to Participating in this Quota Managed Fishery

As the management and performance of the horseshoe crab fishery has evolved in recent years, there are persistent concerns about access. Historically, the fishery was prosecuted by hand harvesters and required limited capital investment. Over time, changes in management and fishery economics shifted harvest towards mobile gear fisheries. With the adoption of the spawning closures in 2025, hand harvest opportunities are now extremely limited, and bait harvest is almost exclusively conducted by mobile gear fishers. Additionally, the 2023 adoption of the biomedical processor quota further shifted the use of this resource towards more capitalized entities. These concerns persist as DMF is now proposing to allocate additional quota to the biomedical processors.

Given the biomedical fishery is catch and release, I think it is critical for participants to have working relationships with biomedical dealers and have their vessels outfitted in a manner that maximizes the survival of horseshoe crabs. I also recognize the logistical benefit provided to biomedical dealers and firms by working with a smaller number of reliable harvesters. However, I do think it is beneficial to have the economic benefits derived from the biomedical use of horseshoe crabs extend along the waterfront. To this goal, I continue my support for the rent-a-crab program and encourage biomedical dealers and processors to accommodate the greatest number of harvesters as practical. However, access remains a concern, and I anticipate further rule making may be warranted in the future to address it.

Dynamic Quota Adjustments and Trip Limit Management

As heard at the November MFAC business meeting, there is interest among the regulated community to have DMF adopt “dynamic management” program to address horseshoe crab quotas. My understanding is that there are several ways DMF could accommodate dynamic management. First, are in-season transfers of quota from the bait fishery to the biomedical fishery based on quota usage by a date certain. Alternatively, DMF could allow horseshoe crabs to be harvested for either purpose by any permitted commercial holder and then grant the purchasing dealer the discretion to determine their fate of each crab and which quota the crab counts against.

There has been some interest in reducing bait fishery trip limits or implementing additional in-season quota use triggers to reduce trip limits. The perceived benefits of these adjustments would be to slow bait quota usage to prevent market gluts. Lastly, there was some discussion of reducing the biomedical trip limit (particularly for trawlers) from 1,000 crabs to a lower number in line with the bait fishery limit. The argument for this is that it would force biomedical dealers to work with more vessels thereby addressing access concerns.

These are interesting concepts that may merit future analysis. However, at present, I worry they would introduce too many new variables to the management program for 2026, will further complicate management, and may contribute to or exacerbate existing fishery management challenges.

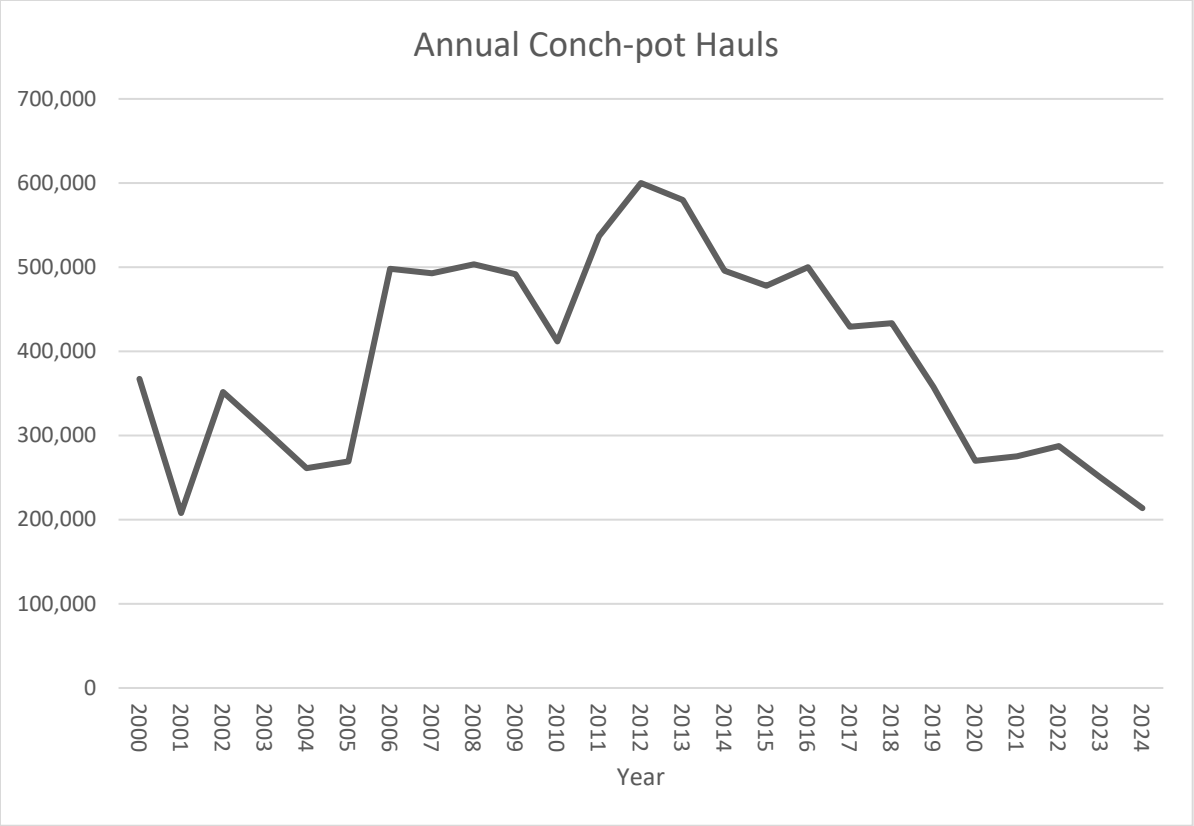


Figure 1. Annual Pot-Hauls in the Massachusetts Conch Pot Fishery, 2000 – 2024.
Data Source: Massachusetts commercial catch reports and federal vessel trip reports as of October 2025. Data for 2024 is preliminary and subject to change. Data for all years may be inflated as permit holders do not distinguish between conch pot and lobster trap hauls and lobster traps may produce some bycatch of channeled whelks.

Year	Bait Crabs Landed	Total Ex-Vessel Value	Average Ex-Vessel Price per Crab
2022	134,753	$287,347	$2.13
2023	139,846	$335,386	$2.40
2024	139,970	$404,331	$2.89
2025*	137,171	$446,853	$3.26

Table 1. Dealer reported Massachusetts horseshoe crabs landing by count, total annual ex-vessel value, and average price per crab, 2022 – 2025. Data source: SAFIS Dealer Database as of December 11, 2025. *Data for 2025 is preliminary and subject to change. Only includes landings reported through December 11, 2025.

Year	Channeled Whelk Landings	Total Ex-Vessel Value	Average Ex-Vessel Price Per Pound
2022	917,700	$3,803,336	$4.14
2023	919,284	$2,993,633	$3.26
2024	718,156	$2,041,735	$2.84
2025*	818,906	$2,599,282	$3.17

Table 2. Dealer reported Massachusetts channeled whelk landings, total annual ex-vessel value, and average ex-vessel price per pound. Data source: SAFIS Dealer Database as of December 11, 2025. *Data for 2025 is preliminary and subject to change. Only includes landings reported through December 11, 2025.

Exhibit B

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Mortality in female horseshoe crabs (*Limulus polyphemus*) from biomedical bleeding and handling: implications for fisheries management

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(*Received 26 October 2009; final version received 25 February 2010*)

Horseshoe crabs (*Limulus polyphemus*) are bled for biomedical purposes to produce Limulus Amebocyte Lysate (LAL), a valuable material used to detect endotoxins in medical devices and implants. Previous studies generally found mortality from the bleeding process of 5–15% with one study reporting 29% for females; the 15% value is now used for management purposes. However, most of these studies looked only at males, did not mimic handling practices typical of the biomedical facility in Massachusetts, or harvested females after the spawning season when much of the actual biomedical harvest occurs. Female mortality is of particular concern because they have greater importance than males for population dynamics, are preferentially harvested, and are more likely to be physiologically stressed than males because of energy outlay for egg production. We examined the mortality of unbled female horseshoe crabs versus that of crabs bled by the local biomedical company and either returned directly to water, or held overnight as is the current practice. Mortality of Control (unbled) crabs was low (3%) and differed significantly ($p < 0.001$) from that of either bled group (22.5% and 29.8% mortality, respectively); the two bled groups did not differ significantly from each other ($p = 0.31$). Mortality rates in bled treatment groups were double those used in current management of the biomedical fishery. The bait and biomedical fisheries are managed differently because biomedical is considered a low-mortality ''catch and release'' fishery. States and interstate management agencies may want to re-examine policies surrounding biomedical horseshoe crab harvest based on these results.

Keywords: horseshoe crab; *Limulus polyphemus*; biomedical bleeding; lysate; sex ratio; Pleasant Bay; harvest

Introduction

Horseshoe crabs (*Limulus polyphemus*) are a valuable and highly contested resource in Massachusetts, as elsewhere along the eastern seaboard of the United States. Historically, this species has been a ubiquitous feature along the coast because crabs come ashore to spawn in spring. Horseshoe crabs are much admired by the public and conservation groups because of the visible spectacle of their beach spawning events and the ''prehistoric'' nature of the animal: a fossilized xiphosurid displaying

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the typical horseshoe crab body plan has been aged at 445 million years (Rudkin et al. 2008). Horseshoe crabs also have important ecological value because of their eggs' role in fueling the northward migration of shorebirds (Botton et al. 1994; Karpanty et al. 2006; Atkinson et al. 2007) and the role they play as bioturbators in estuarine ecosystems (Botton et al. 2003).

In addition to the intrinsic "natural" value of the horseshoe crabs, they support several important commercial industries in Massachusetts. An extract of horseshoe crab blood cells, Limulus Amebocyte Lysate (LAL), is greatly valued as the raw material for a reagent critical to assuring safety of injectable pharmaceutical products and certain medical devices. LAL is used worldwide to detect endotoxins in virtually all medical products injected or implanted into humans, and currently has no substitute. Horseshoe crabs are essential to a multi-million dollar biomedical bleeding industry in Massachusetts. They are also the favored bait for the whelk (*Busycon* spp.) pot fishery, valued at approximately $3 million per year in Massachusetts (Massachusetts Division of Marine Fisheries – DMF – unpublished data). Finally, several bait dealers, draggers, and horseshoe crab fishermen rely on these animals as their primary source of income, and many more supplement their earnings with this species. For these reasons, maintaining horseshoe crab populations and the fishery at sustainable levels is important to both humans and the ecosystem. Recent concerns about overharvest of horseshoe crabs have highlighted the need for accurate assessments of the fishery's impact on populations in order to manage the fishery for sustainability.

Currently, biomedical and bait fisheries are treated separately under Massachusetts regulations. Fishermen hold permit endorsements to fish for one purpose or the other, but not both. Massachusetts does not currently manage biomedical crab fishery with quota, and their harvest is not counted against the annual quota of 165,000 bait crabs. In addition, fishermen with biomedical harvest permits have a daily limit of 1000 crabs, rather than the 400 crab per day limit imposed on fishermen with bait permits. Pleasant Bay, a large embayment on Cape Cod, Massachusetts (Figure 1), is closed to bait fishing, but biomedical harvest is allowed in the Bay except in areas which are part of the Cape Cod National Seashore. The Atlantic States Marine Fisheries Commission (ASMFC) has also treated coast-wide biomedical harvest differently from bait harvest. Addendum IV (ASMFC 2006) to the ASMFC Management Plan for Horseshoe Crabs (ASMFC 1998) maintains the provision that biomedical crabs are not subject to the same restrictions as those for bait use.

The two different sets of rules evolved because the biomedical fishery has been considered a "catch and release" fishery with low mortality. Crabs must be returned to the water body of origin after bleeding, and several previously published studies showed relatively low mortality resulting from bleeding (Rudloe 1983; Kurz and James-Pirri 2002; Walls and Berkson 2003; Hurton and Berkson 2006). Mortality in these studies fell mostly in the 5–15% range, which is the basis of Massachusetts policy, with Hurton and Berkson reporting 29% for females in the high-stress, high-bled group. ASMFC allows a maximum annual mortality of 57,500 crabs coast-wide from biomedical bleeding. The actual annual figure is calculated based on the assumption that 15% of the total biomedical harvest suffers mortality (ASMFC 2009). A mortality rate that is in fact higher than 15% could have implications for management policy in Massachusetts and with ASMFC and its member states.

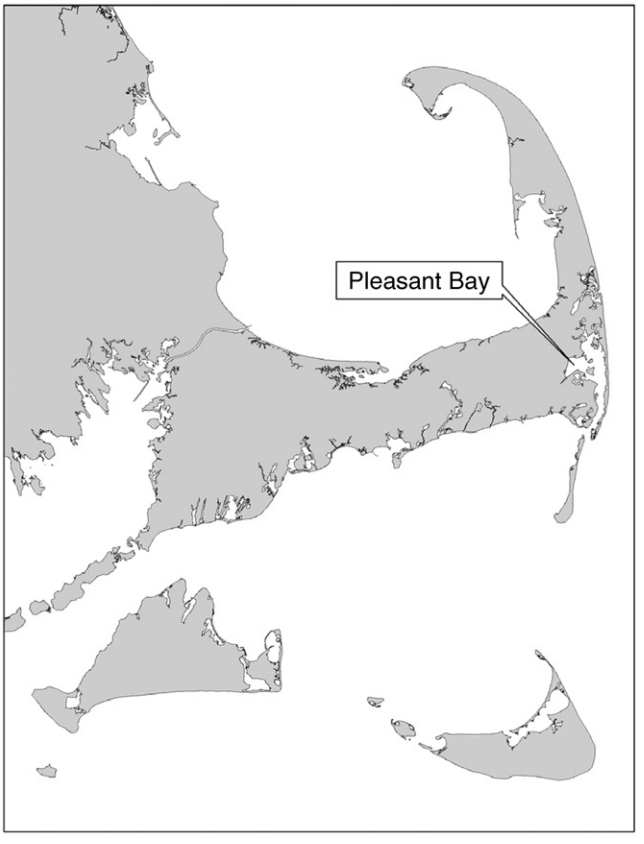


Figure 1. Study area: Pleasant Bay, Cape Cod, Massachusetts.

We began to question the applicability of previous bleeding studies to Massachusetts due to the history of horseshoe crab fishing in Pleasant Bay and results of spawning surveys in this embayment and elsewhere on Cape Cod. Pleasant Bay has been consistently fished for biomedical purposes for nearly 30 years (Frank Germano, DMF, personal communication). For most of that time, bait fishery removals were small or nonexistent. Part of the Pleasant Bay coastline within the Cape Cod National Seashore was closed to all harvest in 2001. The bait fishery in the rest of the Bay rapidly expanded in 2005 and 2006 when a red tide forced the state to ban harvest of bivalves in most areas, and many shellfishermen turned to horseshoe crab harvest as an alternative income source. Bait harvest jumped from a few hundred crabs to 17,800 in 2005 and 40,700 in 2006 (DMF unpublished data) out of an estimated population of 500,000 (Carmichael et al. 2003). Concern by the biomedical company that their crab supply would be rapidly depleted prompted the DMF to place an emergency closure on bait harvest in Pleasant Bay, and to allow only the harvesting of biomedical crabs. The assumption behind this closure was that maintaining a biomedical-only harvest with low-mortality rate in this Bay would facilitate a sustainable fishery.

However, results of spawning surveys conducted in Pleasant Bay and other estuaries that are part of the National Seashore on Cape Cod prompted concern that

Table 1. Females as proportion of the count of horseshoe crabs on spawning beaches by region and year.

	Year					
Region	Historic (1950s)[a]	2000[b,d]	2001[b,d]	2002[b,d]	2008[c,d]	2009[c,d]
Buzzards Bay	N/A	N/A	N/A	N/A	0.41 (0.15–0.69)	0.44 (0.21–0.71)
Cape Cod Bay	0.29	0.24 (0–0.57)	0.26 (0–667)	N/A	0.38 (0–0.75)	0.28 (0–0.55)
Monomoy	N/A	N/A	0.33 (0.25–0.42)	0.38 (0.27–0.49)	0.31 (0.17–0.46)	0.45 (0.26–0.63)
Nauset Estuary	N/A	N/A	0.38 (0.12–0.75)	0.39 (0.17–0.61)	0.43 (0.23–0.64)	0.43 (0.31–0.54)
Pleasant Bay	0.29	0.18 (0.07–0.30)	0.10 (0.02–0.19)	0.17 (0.08–0.27)	0.09 (0.05–0.14)	0.12 (0.09–0.15)
Wellfleet Bay	N/A	0.22 (0–0.46)	0.29 (0–0.62)	N/A	0.32 (0.10–0.56)	0.30 (0.10–0.50)

Notes: Approximate 95% confidence limits are given in parentheses. N/A = data not available (surveys not conducted).
[a]From Shuster (1979). Raw data not available; so no confidence intervals are calculated.
[b]Data adapted from James-Pirri et al. (2005).
[c]DMF and James-Pirri (unpublished data).
[d]Counts of horseshoe crabs by sex were made on various spawning beaches within regions. The sampling utilized a cluster sampling design with multiple sampling of spawning beaches within regions over a spawning season. Approximately 95% confidence limits were constructed using the exact binomial formula using the average number of horseshoe crabs within samples for each region and year as an effective sample size.

biomedical harvest, possibly exacerbated by the 2-year spike in bait harvest, might be disproportionately affecting females. These surveys, modeled after those in Delaware Bay, were conducted in 2000, 2001, 2002, 2008, and 2009 (James-Pirri et al. 2005; James-Pirri unpublished data). During that time period, sex ratios have become increasingly male-dominated in Pleasant Bay, while remaining fairly constant in all other Cape estuaries surveyed (Table 1). Pleasant Bay is the only embayment where only biomedical harvest is allowed, and where this fishery has been in effect for 30 years. The uniqueness of this situation led us to ask whether the biomedical fishery might be behind the sex ratio trend particular to that bay.

This trend was of particular concern because females are much more important in population dynamics than males (Caswell 2000; Grady and Valiela 2007) under the assumption that enough males are available to fertilize females' eggs. We considered several possible explanations for why ratios may have become male-skewed. First, egg production in females of many species has been shown to be an energetically expensive process (Bryant and Hartnoll 1995; Nicol et al. 1995; Guillou and Lumingas 1999; Chaparro and Flores 2002; Lovrich et al. 2005; Jørgensen et al. 2006). Assuming that this is true in horseshoe crabs, this investment of energy prior to the spawning season could render females more physiologically stressed or depleted than males by the bleeding process. Over 50% of harvest and bleeding takes place during or shortly after spawning. Such stress could lead to either higher mortality rates than seen in males, or failure of some females to spawn after bleeding, either of which could explain their relative absence on spawning beaches.

Second, 66% (Rutecki et al. 2004; DMF unpublished data) of the reported biomedical harvest out of Pleasant Bay has been female since 2001, so any biomedical-associated mortality would disproportionately affect females. Third, Rutecki et al. (2004) found that harvested females were significantly larger on average than those in the general Pleasant Bay population; thus the harvest selects for larger animals. Since larger females are more fecund (Leschen et al. 2005), selective harvest, if associated with high mortality or spawning inhibition, could reduce the number of eggs being produced over time. Determining whether the prevailing assumption of 5–15% mortality applied to female horseshoe crabs became an important question, particularly in the case of Pleasant Bay.

In reviewing the literature, we found that the study designs and handling of crabs in previous studies on bleeding mortality were not comparable to the conditions experienced by crabs bled in the Massachusetts biomedical industry. This discrepancy brought into question the applicability of mortality estimates from these studies to the biomedical fishery in Pleasant Bay. Walls and Berkson (2003) used only males, whereas we were primarily interested in females. Kurz and James-Pirri (2002) focused primarily on movement patterns and had small sample sizes. Rudloe (1983) kept the crabs out of water only long enough to draw blood and did not account for the substantial handling that biomedically bled horseshoe crabs undergo during the harvesting/bleeding process. Handling of crabs in the Massachusetts biomedical industry has typically included time spent on an open boat deck during harvest, an hour drive in a non-air-conditioned truck to the bleeding facility, bleeding suspended upside down in racks until the blood clots naturally, and 24 h out of water stacked in 30 gal Rubbermaid containers at room temperature before being returned to the water after another 1 h truck ride and 15 min boat ride. In addition, crabs may have been further stressed by being bled more than once in a season, as no reliable system of marking was in place for bled crabs until 2009. In another study, Hurton and Berkson (2006) used crabs that had been caught in a dragger fishery in July and August, rather than hand-harvested during spawning season. Nevertheless, the latter study found that females that underwent the highest bleeding level and stress had a mortality of 29.4%. This figure, which resulted from conditions most closely resembling those practiced in Massachusetts, and which is nearly double the 15% currently used when setting quota management, led us to believe that a study focusing on females that underwent realistic handling would be prudent. Hurton and Berkson's finding of 29.4% mortality has not previously been used in management because that study did not focus on that group – rather the figure was "diluted" in the discussion by being averaged in with lower mortality rates of males and less-handled females.

Meanwhile, discussions with the biomedical industry about handling practices led them to agree to obtain a refrigerated truck in which crabs would be transported and stored overnight, fill the barrels only two-thirds full to lessen pressure on the bottom crabs, and keep barrels covered with wet burlap to minimize evaporation from the crabs' gills. To avoid re-bleeding the same crab within a season they also agreed to make a small notch on the edge of the opisthosoma, alternating sides each year. DMF also theorized that returning the crabs to the water the same day as bleeding would likely increase survival, but this practice would increase handling costs and time for both the company and the fisherman who returns them to the water. We decided to test (1) the difference in mortality between unbled control female crabs and female crabs handled and bled according to the new best

management practices (BMPs) agreed upon by DMF and the Massachusetts biomedical industry and (2) the difference between mortality in those two groups versus an additional treatment wherein the crabs were subjected to new BMPs but were returned to the water the same day they were bled. We limited our study to females for the reasons described above, because Walls and Berkson (2003) had studied male mortality (exclusively), and because tank space was limited and we wanted room for an adequate sample size of females.

Methods

Crabs were divided into three treatment groups and held in six flow-through seawater tanks at the Marine Biological Laboratory (MBL) in Woods Hole. This facility is located approximately 1.25 h drive from Pleasant Bay, and 15 min from the biomedical company. Tanks were prepared by placing approximately 5 cm of sediment on the bottom so that crabs could burrow, and running seawater through for several days to clear out fines and detritus in the sediment. Lights are on during the day, but the facility is dark at night. The total number of crabs assigned to each tank approximated an equal number of crabs per area for all tanks. Tanks differed by volume and shared a common water flow. A similar number of crabs from each treatment group was assigned to each tank (±1 for sizes not evenly divisible by 3). The three treatment groups were as follows:

(1) Group (Treatment) 1 – control (unbled)
(2) Group (Treatment) 2 – bled and handled according to new BMP but crabs returned to water the same day.
(3) Group (Treatment) 3 – bled and handled according to new BMP but returned to water the morning following bleeding.

Approximately 310 female horseshoe crabs were obtained from the biomedical fisherman in Pleasant Bay early in the morning of 2 June 2009. Crabs were randomly assigned to one of the 18 categories: three treatments and six tanks. Each crab was measured (prosomal width – PW in mm), labeled with two lobster bands (cut in half lengthwise to facilitate doubling over, two bands used for security in case one came off) on the telson. Bands on each crab were one of three colors depending on group (treatment) assignment. After measuring and labeling, crabs were placed in Rubbermaid barrels labeled with their group and tank number. Sorting was carried out inside an air-conditioned truck cooled to approximately 10°C at the dock. Barrels with crabs waiting to be sorted were covered with wet burlap, as were all barrels after sorting was finished.

After sorting was completed, the truck was driven to the biomedical company. Groups 2 and 3 were dropped off for bleeding, and Group 1 crabs were driven to the MBL and were placed immediately in their respective tanks (time out of water was 4 h). Groups 2 and 3 crabs were bled at the biomedical facility according to the standard procedures which included placing the crabs upside down in racks, puncturing the arthrodial membrane with a needle, and allowing blood to drain into a collecting vessel until bleeding stopped on its own. Group 2 crabs were then driven to the MBL, for a time out of water totaling 6 h. Group 3 crabs remained inside the facility (as they normally would) until the truck returned. They were then transferred into the refrigerated truck where they remained overnight with the

thermostat set at 8.9°C. These crabs were driven to the MBL at 6 am the next morning, for a time out of water totaling 25 h, as is the current practice. After being dropped at the MBL, Groups 2 and 3 barrels were left in the parking lot for 15 min and shaken occasionally, to simulate the 15 min boat ride they would normally have in Pleasant Bay before being returned to the water. They were then distributed to their assigned tanks.

Twelve crabs were rejected during sorting due to injury or other damage. Another 17 crabs (5.7% – 11 from Treatment 2 and six from Treatment 3) were sorted but later classified as not bleedable by the biomedical company because they did not meet qualifications for bleeding – injured, too small, damaged arthrodial membrane, etc. – were excluded from the study without replacement. A total of 99 crabs received Treatment 1 (Control), 89 received Treatment 2, and 93 received Treatment 3. Thus, crabs deemed not bleedable by the company were included in the Control group but not the treatment groups.

The tanks were checked daily for mortalities and dead crabs were removed. PW, band color, and date of death were recorded. MBL staff caring for the crabs was blind to treatments and did not know the details of the study or band color code until the study's conclusion. Temperature (T) and dissolved oxygen (DO) were recorded for each tank daily. Since crabs would presumably be foraging if returned to the wild, they were fed three times per week for the 17-day duration of the study. This time period was primarily a function of tank and funding availability.

Mortality rate was modeled as a function of treatment and tank with PW as a covariate using a generalized linear model (GLM) logistic regression with binomial errors using R software (R Development Core Team 2009). Several candidate models, ranging from a full model with interactions between treatment, tank and PW to just marginal treatment effects were evaluated using Analysis of Deviance. Marginal effects of treatment were examined using a model with treatment only. Difference in T and DO among the tanks was calculated for tank and day effects using two-way ANOVA.

Results

The first mortality was recorded on the third day of the study, and 84.3% of mortalities in the bled groups had occurred by day 6. Highest mortalities occurred on days 4 (13.7%), 5 (49%), and 6 (19.6%). The general pattern of die-off was consistent in the two bled groups. The Controls died on days 6, 7, and 17 (the one on day 17 had a previously undetected injury that may have caused its death).

Analysis of Deviance indicated that treatment and tank were significant factors in explaining mortality, but tank-interaction and PW as a covariate (Figure 2) were not significant (Table 2). Predicted mortality rates with approximately 95% confidence intervals by treatment and tank are provided in Table 3. Mortality rate for the Control was significantly different from Treatment 2 ($p < 0.001$) and Treatment 3 ($p < 0.001$). Treatments 2 and 3 were not significantly different from each other ($p = 0.31$).

Tank effects were relatively small compared with treatment effects. The odds ratio of dying in tanks 2–6 compared to Control in tank 1 ranged from 0.4 to 3.7. The odds ratio of dying from Treatments 2 and 3 compared to the Control was 10.3 and 14.6, respectively. The odds ratio for Treatment 2 compared to Controls in tank

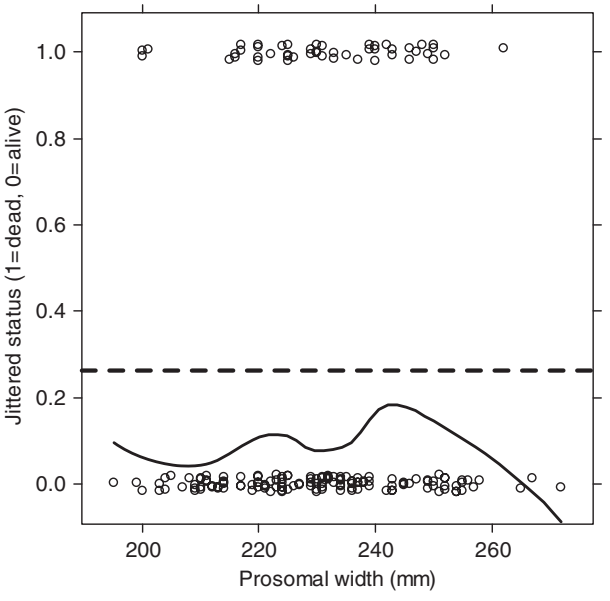


Figure 2. Jittered status (1 = dead, 0 = alive) by PW for Treatments 2 and 3 pooled. Black solid line is Loess fit, representing mortality at PW. Dashed line is mean mortality rate (0.26) for the two groups combined over all PWs.

Table 2. Analysis of Deviance for select GLM models.

Candidate model	Df	Residual deviance	Df	Deviance	Probability	Akaike information criteria
Treatment*tank*PW	245	200.884				272.88
Treatment*tank + PW	262	212.670	−17	−11.786	0.81	250.67
Treatment + tank + PW	272	223.833	−10	−11.163	0.35	241.83
Treatment + tank	273	223.919	−1	−0.086	0.77	239.92
Treatment	278	236.168	−5	−12.250	0.03	242.17

Notes: Model formula based on Wilkinson–Rogers notation.
*Indicates model includes estimating interaction term between factors or separate intercepts and slopes for covariates.

1 ranged from 4.4 to 38.2, while the odds ratio for Treatment 3 compared to Controls in tank 1 ranged from 6.3 to 54.4 (Table 3).

In the model including only marginal treatment effects, the mortality rate was 0.031 in Control, 0.225 in Treatment 2, and 0.298 in Treatment 3 (Table 4). Treatments 2 ($P < 0.001$) and 3 ($P < 0.001$) were significantly different from the Control. Treatments 2 and 3 were not significantly different ($P = 0.26$). Treatment 2 had 9 times and Treatment 3 had 13 times the odds of dying as in the Control group (Treatment 1).

Differences in densities between tanks were negligible (Table 5), and marginal tank predicted mortality was not related to tank densities. DO ranged from 5.91 to

Table 3. Predicted mortality rates by treatment and tank with approximately 95% confidence interval.

Treatment	Tank	Total crabs	Predicted mortality rate	Lower 95%	Higher 95%	Odds ratio
1 (Control)	1	16	0.017	0.004	0.069	
	2	21	0.028	0.008	0.096	1.6
	3	16	0.061	0.018	0.190	3.7
	4	13	0.008	0.001	0.046	0.4
	5	16	0.043	0.012	0.143	2.6
	6	16	0.024	0.006	0.090	1.4
2	1	15	0.152	0.063	0.321	10.3
	2	19	0.225	0.116	0.391	16.7
	3	13	0.400	0.228	0.601	38.2
	4	14	0.072	0.017	0.255	4.4
	5	14	0.314	0.167	0.511	26.2
	6	14	0.203	0.094	0.384	14.6
3	1	17	0.203	0.091	0.392	14.6
	2	21	0.293	0.163	0.467	23.7
	3	14	0.487	0.300	0.678	54.4
	4	9	0.099	0.024	0.329	6.3
	5	15	0.395	0.226	0.592	37.3
	6	18	0.265	0.135	0.455	20.7

Note: Odds ratio compares odds of dying in any cell with odds of dying as a control in tank 1 (0.02 : 1).

Table 4. Predicted mortality rate with approximately 95% confidence limit from a model using only treatments.

Treatment	Predicted mortality rate	Lower 95%	Higher 95%	Odds ratio compared with odds of control
1 (Control)	0.031	0.01	0.09	
2	0.225	0.15	0.32	9.2
3	0.298	0.21	0.40	13.4

Note: Odds ratio compares odds of dying in a treatment to odds in controls (0.032 : 1).

Table 5. Crabs m^{-2} in each tank after unbleedables removed from sample.

Tank	Crabs m^{-2}	DO (ppm) Mean (range)	T (C) Mean (range)
1	7.2	9.2 (8.4–9.7)	15.4 (14.8–16.1)
2	6.7	8.9 (7.2–9.6)	15.7 (14.8–16.3)
3	6.6	9.4 (8.4–9.9)	15.4 (14.8–16.0)
4	6.1	8.6 (5.9–9.9)	15.6 (14.9–16.4)
5	6.9	9.1 (8.0–9.8)	15.4 (14.8–15.9)
6	7.2	8.6 (7.6–9.1)	15.6(14.8–16.4)

Note: DO and T mean and range in each tank.

9.91 ppm with an overall mean of 8.95, well above the minimum of 5.0 ppm recommended for aquaculture systems (Timmons et al. 2001). Temperature ranged from 14.8 to 16.4°C with an overall mean of 15.5. A two-way ANOVA of DO indicated that tank ($p < 0.001$) and day effects ($p < 0.001$) were significant for DO. Similarly, ANOVA of T indicated significant tank ($p < 0.001$) and day effects ($p < 0.001$). Unlike other tanks, tank 4 showed a declining trend in DO over the first 8 days. Low values of 5.91 and 6.80 ppm were recorded on days 8 and 9 in tank 4, at which point it was discovered that flow into that tank was low; this was corrected, and DO values increased. A correlation between mean tank DO and marginal predicted tank mortality was 0.73 with a 95% CI $= -0.20 - 0.97$ and a ($p = 0.10$). Although not significant at 5% significance, the relatively high correlation and low probability suggests that variation in DO may have contributed to tank effects. No relationship was observed between marginal predicted tank mortality and either temperature or crab densities. Tank 4 contributed towards low mortality and had the lowest mean DO while tank 3 had the highest mean DO and highest marginal tank mortality.

Discussion

Our study showed higher female mortality from biomedical bleeding than previously reported, except the group of females with the highest level of bleeding and handling in Hurton and Berkson (2006), where mortality was virtually identical to that of our Group 3 (29.4% and 29.8%, respectively). These mortality rates are considerably higher than those currently used for management in both Massachusetts and by ASMFC (15%). It is worth noting that our study did not include males; as such, we recommend management to use the male mortality based on previous studies such as Walls and Berkson (2003).

In this experiment, 12 crabs were rejected by DMF because of injury or other defects at the dock. Another 17 crabs were rejected by the biomedical company from Treatments 2 and 3 as unfit for bleeding. Our estimate of mortality rate does not include the harvest-induced mortality component of rejected crabs. Since crabs deemed not bleedable were included in the Control group but not in the treatment groups, the odds ratios for the treatments compared to the Control may have been underestimated if non-bleedable crabs have higher mortality rates in captivity. This potential bias would have the impact of underestimating the difference in mortality between the control and the two treatments. The biomedical company's typical percentage of crabs that do not meet criteria for bleeding due to injury or death for MA biomedical crabs is 5.0%; it was 5.7% in this study.

Although we observed a significant tank effect, the only obvious pattern that emerged is that tank 4 exhibited particularly low mortality (Table 3). Although DO and T varied among tanks, the lowest DO was recorded in tank 4, where mortality rate was the lowest. No obvious positional, lighting, or other differences among the tanks were discernable that could explain the difference in mortality. The source of variation in mortality among tanks remains unexplained and may simply reflect type I error.

Until now, the absence of annual quota for the biomedical horseshoe crab fishery in Massachusetts and the ASMFC annual biomedical quota have been based on an assumption of no more than 15% mortality. Our mortality rate of 30% for the

treatment mimicking current practices may, if anything, underestimate actual bleeding mortality for several reasons. First, crabs in our study were handled with more care than has been the practice of the biomedical company over the past 30 years – air-conditioned truck and storage, less-full barrels, barrels covered with wet burlap, and notching to prevent re-bleeding. Mortality under the old practices may have been even higher. Second, harvest-associated mortality of rejected crabs was not followed or included in the data. We note that crabs can be rejected due to injury as well as damage to the arthrodial membrane.

Our study did not address the question of whether there are sublethal effects on spawning behavior. This question deserves more study since sex ratios are becoming highly skewed toward males, yet the biomedical harvest, which occurs away from the spawning beaches, is still highly skewed toward females. Although some bled (notched) crabs have been sighted on spawning beaches, this apparent inconsistency in sex ratios on and off the spawning beaches may indicate that some bled females still present in the population may not be appearing on beaches to spawn.

The biomedical industry contributes not only to local economies where they are sited, but also provides essential products necessary for human health and safety. Curtailing their operations by restricting harvest may not be desirable in the short term. However, having marked decline in populations could permanently reduce biomedical harvest and undermine the industry. Results of this study show that previously reported mortality rates of bled horseshoe crabs may not accurately reflect deaths of crabs harvested and handled in the Massachusetts biomedical industry.

Conclusion

Amidst growing concern about horseshoe crab populations in Massachusetts and sex ratios in Pleasant Bay, managing the fishery for sustainability is increasingly important. Management must therefore be based on realistic estimates of total mortality that reflect handling and bleeding procedures to which local biomedical crabs are subjected. This study provides estimates of female mortality, which are disproportionately more important than that for males, both because of their importance to population dynamics and because they are preferentially harvested.

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Exhibit C

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THE IMPACT OF BIOMEDICAL BLEEDING ON HORSESHOE CRAB, *LIMULUS POLYPHEMUS*, MOVEMENT PATTERNS ON CAPE COD, MASSACHUSETTS

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The purpose of this study was to determine if bleeding, for biomedical purposes, influenced the behavior of horseshoe crabs, *Limulus polyphemus*. In the summer of 2001, ten bled and ten control (unbled) female horseshoe crabs were tracked for 26 days using acoustic telemetry in a small estuary on Cape Cod, Massachusetts. All but three crabs, two bled and one control, were located during the study period. No mortality was observed in the control group, while 20% mortality was observed within the bled group. There was no significant difference in the average rate of movement or in the spatial distribution within the estuary between the two groups. However, a difference was detected in the movement patterns. Horseshoe crabs from the bled group had a random direction of movement compared to the directional movement pattern of the control group, suggesting that the bled crabs experienced more disorientation.

Keywords: Horseshoe crab; Behavior; Acoustic telemetry

INTRODUCTION

The American horseshoe crab, *Limulus polyphemus*, is exploited by both a commercial bait fishery and the biomedical industry (ASMFC, 1999). The biomedical industry uses blood from horseshoe crabs in the production of *Limulus* ameobocyte lysate or LAL, which is the standard test used to detect endotoxins pathogenic to humans in all injectable drugs and implantable medical devices (Novitsky, 1984). During the bleeding process up to 30% of the blood volume is removed from the horseshoe crab (Novitsky, 1984). All bled horseshoe crabs collected for LAL production must be released within 72 h of capture as mandated by the United States Food and Drug Administration (ASMFC, 1998). Previous studies have estimated that horseshoe

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crabs used for biomedical bleeding suffer an 8–15% mortality rate from the procedure (Rudloe, 1983; Walls and Berkson, 2000; Wenner and Thompson, 2000). However, the influence of bleeding on horseshoe crab behavior and long-term survival are unknown. This study evaluated the behavior patterns of bled and control (unbled) female horseshoe crabs in a natural setting using acoustic telemetry.

METHODS

Twenty female horseshoe crabs were collected from Pleasant Bay and Nauset Estuary within Cape Cod National Seashore, Cape Cod, Massachusetts in July of 2001. All horseshoe crabs used in this study were larger than 200 mm prosomal width (Table I) and free of epibionts, similar to individuals that are typically used by biomedical facilities for blood extraction. The twenty horseshoe crabs were treated in pairs, with one horseshoe crab from each of the ten pairs randomly chosen and bled. The individual that was to be bled was placed in a stand, similar in design to those utilized by the

TABLE I Summary of information for horseshoe crabs used in study. Number of days detected refers to the actual days where the individual's signal was located. Total number of data points refers to the number times a signal and corresponding GPS coordinates were recorded for the individual. The number of consecutive data points (within a 12 h period) for each individual is given in parentheses. Status indicates available current information on the location of the individual

Crab no.	*Treatment*	*Prosomal width* (mm)	*Blood volume removed* (mL)	*First day detected*	*Last day detected*	*No. of days detected*	*Total number and (consecutive) data points*	*Status as of spring 2002*
234	bled	232	120	7/7/01	7/31/01	4	11 (9)	unknown
245	bled	261	90	–	–	0	0 (0)	signal never detected
253	bled	215	76	7/4/01	7/19/01	5	11 (8)	dead (7/30/02)
267	bled	265	100	7/6/01	7/6/01	1	1 (0)	unknown
336	bled	221	82	7/4/01	7/31/01	7	10 (6)	dead (9/8/02)
344	bled	212	86	7/4/01	7/20/01	9	10 (4)	unknown
347	bled	217	104	7/6/01	7/10/01	2	3 (2)	unknown
353	bled	219	81	8/11/01	8/11/01	1	1 (0)	unknown
433	bled	221	85	7/9/01	7/25/01	4	6 (4)	unknown
457	bled	261	75	7/9/01	7/11/01	2	2 (0)	unknown
254	control	225	0	–	–	0	0 (0)	unknown
455	control	209	0	7/9/01	7/13/01	2	2 (0)	unknown
477	control	255	0	7/10/01	7/10/01	1	3 (3)	unknown
553	control	233	0	7/4/01	7/25/01	7	21 (19)	unknown
555	control	229	0	7/4/01	8/2/01	9	25 (20)	transmitter found spring '02
563	control	219	0	7/6/01	7/22/01	7	8 (2)	unknown
566	control	208	0	7/4/01	8/17/01	10	17 (9)	transmitter found spring '02
634	control	213	0	7/12/01	7/12/01	1	1 (0)	unknown
666	control	251	0	7/4/01	7/31/01	7	22 (21)	unknown
673	control	256	0	–	–	0	0 (0)	signal never detected

biomedical companies, to hold the horseshoe crab and expose the articular membrane. The articular membrane was swabbed with 70% isopropyl alcohol and a sterile, disposable, pyrogen-free, 14-gauge, 2-inch hypodermic needle was inserted into the articular membrane to drain blood from the cardiac sinus. The needle was removed once the blood flow from the cardiac sinus slowed to an intermittent drip. An average of 90 mL of blood (Table I) was removed from each of the ten female horseshoe crabs. Time out of the water was same for both treatment groups and did not exceed 30 min.

Sonic transmitters (Sonotronics, Tuscon AZ) 64 mm in length, 16 mm in diameter, and weighing 8 g, were attached to each of the twenty horseshoe crabs. The transmitter was fastened to the top of the prosoma using marine epoxy and a three-point monofilament harness. Each sonic transmitter emitted a unique signal, thus tracking multiple animals was possible. The sonic transmitters were detectable up to 1000 m and have a battery life of 14 months. A signal can only be detected when the transmitter is in the water, therefore if a horseshoe crab was out of the water the signal would not be detected. Alternatively, if an individual dies in the water, the signal would be detected but there would be no movement associated with that particular signal. All horseshoe crabs were released in pairs at the same location in Nauset Estuary from July 2 to 8, 2001 and were tracked using a hydrophone during July and August.

Nauset Estuary is a small system (600 hectares) within the boundaries of Cape Cod National Seashore. Horseshoe crabs within the estuary typically spawn from mid-May to early July, and a known spawning beach is located in the northern portion of the estuary (Fig. 2) (James-Pirri *et al.*, 2002). Due to its small size and shallow depths, locating signals from the transmitters was possible using a hydrophone from the platform of a kayak. A handheld geographic positioning system (GPS) unit was used to record the geographic coordinates of signals from the tagged horseshoe crabs. Once a signal was located, the individual was tracked for approximately 15 min (if possible) and the GPS coordinates and time of day were recorded every 3–5 min. Then the estuary would be searched for another signal and the process would continue. We also recorded the GPS coordinates of locations where no signals were detected to evaluate which areas of the estuary were frequented by horseshoe crabs. Often we would return to the location of previous signals one to five hours later to determine if the horseshoe crab was still in the area and to collect additional data. We refer to a signal from a transmitter and corresponding GPS coordinates and time as a datum point. Consecutive data points refer to data where an individual was tracked over time and information on its location was recorded at 3–5 min intervals.

Average rate of movement ($m\,min^{-1}$) was calculated for horseshoe crabs where data points (a detected signal, corresponding GPS coordinates, and time) occurred within a 12 h period. The 12 h criterion was chosen since this was the time frame on any one day when the estuary could be searched for horseshoe crabs. If data points were included that spanned longer than 12 h, the rate of movement would be underestimated since crabs tended to return to the same areas on the each tidal cycle and thus distance traveled between data points would be small, whereas the time period between data points on different days would be great (1 or more days). To calculate the rate of movement, the time interval between consecutive data points within a 12 h period was determined and distance traveled was calculated from the GPS coordinates for those data points. Rate of movement for each individual (individuals were the replicates) was then calculated as the total distance traveled divided by the total time between consecutive data points within a 12 h period.

To determine differences between the rate of movement for bled and control groups, a One-way ANOVA was performed on the average rate of movement for each treatment group where consecutive data points on individuals were collected within a 12 h period. Prior to analyses, tests for normality and homogeneity of variances were conducted and the data were found not to violate the assumptions of ANOVA. Only 12 of the 17 horseshoe crabs that were located had consecutive data points that met the 12 h criteria, and thus only these individuals were included in the analyses of rate of movement (Table I).

GPS coordinates were entered into GIS software and superimposed with geographic data to display the spatial distribution of the horseshoe crabs within Nauset Estuary (Fig. 2a–c). To determine if the spatial distribution and movement of the two treatment groups displayed a nonrandom or random pattern, all data points were analyzed by Biotas® software from Ecological Software Solutions. Biotas® software provides a variety of analyses of spatial and temporal data including analyses of spatial dispersion, spatial autocorrelation, spatial randomness, and movement patterns. Additionally, GIS data can be used as an overlay to confine the analyses of spatial distribution and movement patterns to abiotic and biotic limits of the organism (e.g. home range, water bodies). Biotas® was used to evaluate the data with the Moran's I Test (Moran, 1950) and the Movements Analysis test within the boundaries of Nauset Estuary. The Moran's I Test uses a grid overlay on the pattern of geographic points within Nauset Estuary to analyze data in adjacent grids to determine if there is a spatial pattern such as spatial clustering. We used this test to evaluate if horseshoe crabs from the two treatment groups differed in their spatial autocorrelation (i.e. did the treatment groups have different spatial patterns) within Nauset Estuary. A high spatial autocorrelation would imply that the horseshoe crabs were not randomly distributed. The Movements Analysis takes a circular measure, a bearing, and converts it to a linear measure, an angle, and then uses the angle measure to test if changes in the animal's direction of movement (e.g. number of left and right turns) are significantly different than what would be expected from random chance. We used this test to determine if the pattern of movement, in terms of directional change, differed between the two treatment groups.

RESULTS

Seventeen (9 control, 8 bled) of the twenty horseshoe crabs were located after release. Three horseshoe crabs (one control and two bled) were not located during the study period. These three individuals could have moved out of Nauset Estuary, traveled to deeper water, or died with their bodies stranded out of the water where the transmitter signal would not be detected. Two of the horseshoe crabs from the bled treatment were found dead within Nauset Estuary 28 days and 68 days post bleeding. No mortality was observed among the control group. Horseshoe crabs from both groups frequented the same general area (northern portion) of the estuary (Fig. 2a,b). Locations where no signal was detected are shown in Fig. 2c.

There was no significant difference in rate of movement (One-way ANOVA, $p = 0.261$) between the bled and control horseshoe crabs (Fig. 1). However, due to the low sample size and associated variability, the power of this test was very low (power = 0.13, alpha = 0.05) indicating that the probability of failing to detect a

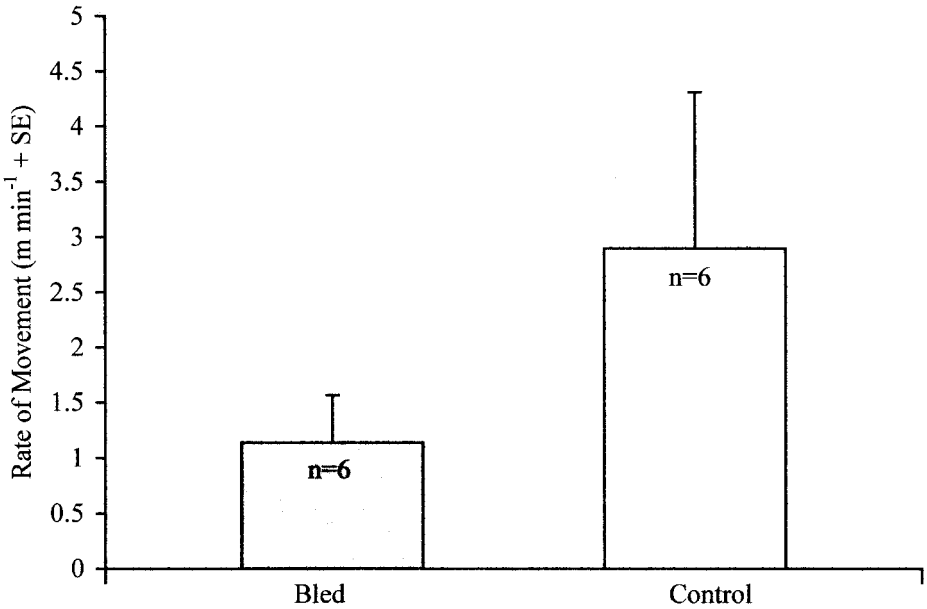


FIGURE 1 Rate of movement for bled and control horseshoe crabs.

difference between the treatments when a difference actually existed (i.e. Type II error) was 87%. To increase the power of the test to an acceptable level (i.e. power = 0.8, alpha = 0.05) we would have needed more than twice as many replicates within each treatment group.

The null hypothesis of no spatial autocorrelation was rejected by the Moran's I Test for both treatment groups (bled: Z-score = 4.517, $p > 0.05$; control: Z-score = 4.506, $p > 0.05$) indicating that both groups exhibited spatial autocorrelation (clustering), and therefore had a nonrandom distribution patterns within Nauset Estuary (Fig. 2a,b). The Movement Analyses indicated that the bled group exhibited a random direction of movement (Z-score = 0.43, $p < 0.05$), whereas the control group exhibited directional movement patterns (Z-score = 2.71, $p > 0.05$).

DISCUSSION

Our telemetry data show that horseshoe crabs from both treatment groups frequented similar areas of the estuary, particularly the northern portion that contains extensive tidal flats, while other areas were not extensively used by the horseshoe crabs. These shallow tidal flats are most likely an important foraging area since horseshoe crabs are predators on intertidal fauna (Botton, 1984a,b). It is interesting to note that the small beach used by horseshoe crabs for spawning in this area also has the highest horseshoe crab egg densities observed on beaches surveyed within Cape Cod (James-Pirri *et al.*, 2002). We have periodically searched for signals from the horseshoe crabs over the winter of 2001 through the summer of 2002, and have not yet located any of the animals from this study, although 2 transmitters that had fallen loose from the horseshoe crabs were recovered in the spring of 2002 within Nauset Estuary.

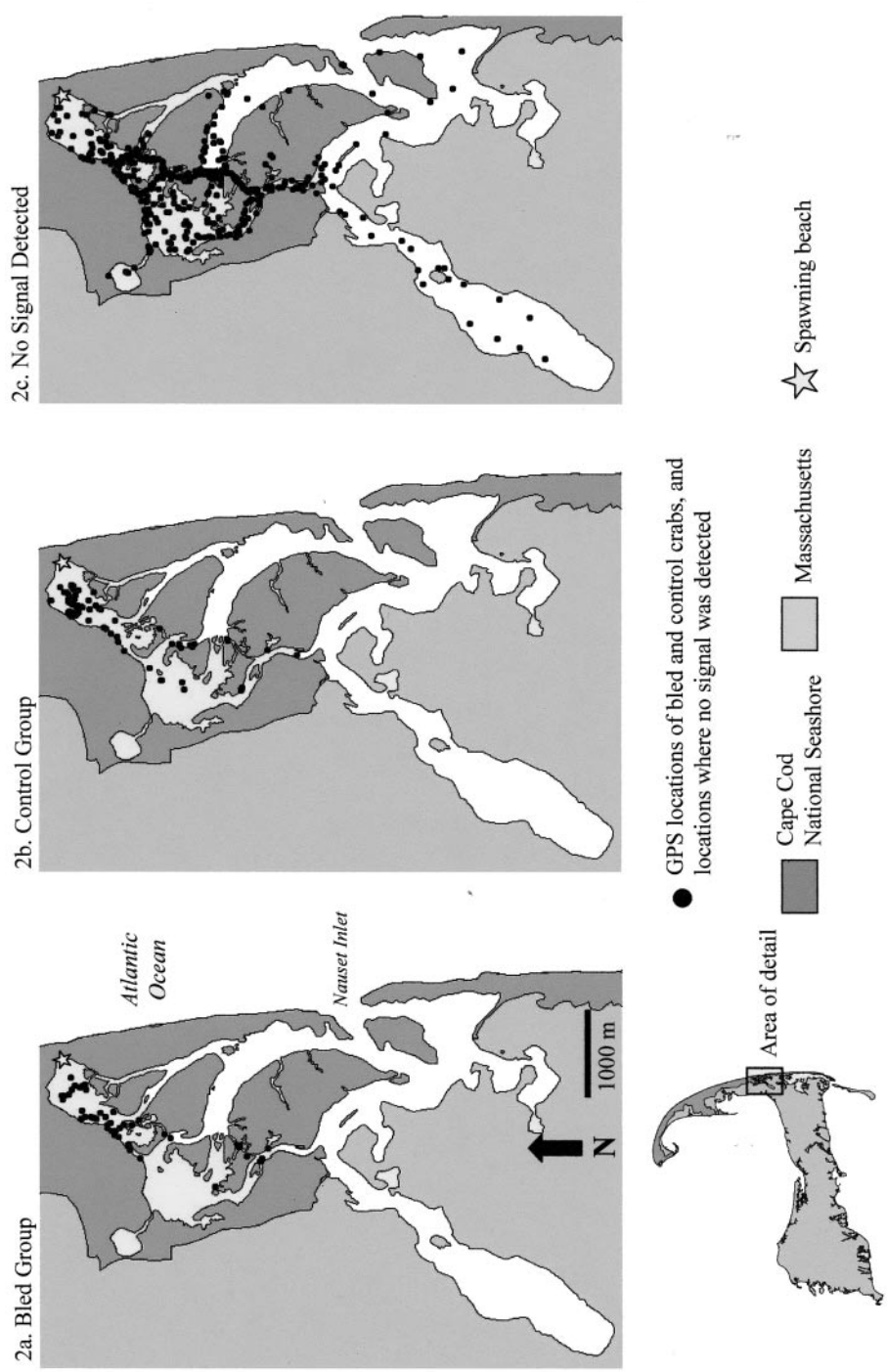


FIGURE 2 Map of Nauset Estuary showing the distribution of sonar signals for bled (2a) and control (2b) horseshoe crabs and locations where no signal was detected (2c).

The 20% mortality observed within the bled group is slightly higher than the 8–15% mortality estimated in previous studies (Rudloe, 1983; Walls and Berkson, 2000; Wenner and Thompson, 2000). However, the slightly higher mortality rate observed in this study may have been an artifact of low sample size.

We found no difference in the rate of movement between the bled and control groups, although there was a trend towards a lower rate of movement in the bled horseshoe crabs. Unfortunately, the statistical power of the test was low and probably of a Type II error was high. Both groups showed similar spatial distribution patterns, most likely related to foraging areas within the estuary. However, the bled horseshoe crabs did not exhibit the same type of movement as the control crabs. The bled group had a random movement pattern compared to the directional movement pattern of the control group, suggesting that the bled horseshoe crabs experienced more disorientation, presumably resulting from the bleeding procedure and the associated loss of blood volume. If this disorientation prevents horseshoe crabs from locating spawning beaches, bled horseshoe crabs may have a reduced reproductive output compared to those that are not bled. Unfortunately, due to the small number of horseshoe crabs where appropriate data were collected for statistical analyses, these results do not permit a conclusive statement about the influence of bleeding on horseshoe crab behavior and we believe that further investigation is warranted based on the observed disorientation and the trend of lower activity of the bled horseshoe crabs.

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Exhibit D

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Sub-lethal behavioral and physiological effects of the biomedical bleeding process on the American horseshoe crab, *Limulus polyphemus*

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Abstract

The hemolymph of the American horseshoe crab, *Limulus polyphemus*, is harvested from over 500,000 animals annually to produce Limulus Amebocyte Lysate, a medically important product used to detect pathogenic bacteria. Declining abundance of spawning *Limulus* females in heavily harvested regions suggests deleterious effects of this activity and, while mortality rates of the harvest process are known to be 10–30%, sub-lethal behavioral and physiological effects are not known. In this study, we determined the impact of the harvest process on locomotion and hemocyanin levels of 28 female horseshoe crabs. While mortality rates after bleeding (18%) were similar to previous studies, we found significant decreases in the linear and angular velocity of freely moving animals, as well as changes in their activity levels and expression of circatidal behavioral rhythms. Further, we found reductions in hemocyanin levels, which may alter immune function and cuticle integrity. These previously unrecognized behavioral and physiological deficits suggest that the harvest of Limulus Amebocyte Lysate may decrease female fitness, and thus may contribute to the current population decline.

Keywords

American horseshoe crabs; *Limulus polyphemus*; circadian; circatidal; LAL; bleeding; activity

Introduction

The American horseshoe crab, *Limulus polyphemus*, is valued for both its ecological and economic importance. Ecologically, *L. polyphemus* is a keystone species in marine ecosystems of the Atlantic and Gulf coasts of North America (Botton, 1984b), serving as a bioturbator (Krauter and Fegley, 1994; Lee, 2010), a food source for shorebirds, fish and crustaceans (Botton 1984a), and a predator of mollusks and polychaete worms (Botton, 1984b). Commercially, *L. polyphemus* is the preferred bait source for the whelk (*Buscyon carica*, *Buccinum undatum*, and *Busycotypus canaliculatus*; ASMFC, 2012) and eel (*Anguilla rostra* and *Anguilla Anguilla*: ASMFC, 1998) fisheries, and its hemolymph provides the raw material for Limulus Amebocyte Lysate (LAL), the industry standard for

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detection of bacterial endotoxin in pharmaceuticals, vaccines, and medical devices (Novitsky, 2009). The magnitude of the LAL harvest, principally composed of female horseshoe crabs (50–77%; Rutecki *et al*., 2004; ASFMC, 2012), has increased 76% since 2006, during which time New England populations of *L. polyphemus* have declined, despite a 45% bait harvest reduction (ASMFC, 2012). Further, population trends in heavily harvested Pleasant Bay, MA, have evoked concern over possible effects of the LAL harvest process (Malkoski, 2010; ASFMC, 2012; James-Pirri, 2012). In this region, where horseshoe crabs have been harvested for LAL production for over 30 years, but closed to the bait fishery since 2006 (Rutecki *et al*., 2004; Leschen and Correia, 2010), the proportion of females appearing at spawning beaches has declined from 30% (Carmichael *et al*., 2003) to 10% (Malkoski, 2010; James-Pirri, 2012) and egg abundances at spawning beaches have significantly decreased (James-Pirri, 2012). These trends have prompted researchers and environmental managers to suggest that the LAL harvest process, while causing moderate mortality rates of 8–15% in males (Walls and Berkson, 2003; Hurton and Berkson, 2006) and 10– 29% in females (Hurton and Berkson, 2006; Leschen and Correia, 2010), may also induce behavioral and physiological effects in *L. polyphemus*, which could lead to alterations in spawning activity (Malkoski, 2010; James-Pirri, 2012). Moreover, these effects could be exacerbated by the high level (50%) of the annual LAL harvest that occurs during the spawning season (Leschen and Correia, 2010).

The LAL harvest procedure incorporates multiple stressors, several of which have been shown to alter both the behavior and physiology of marine species. Briefly, hemolymph is obtained in a 24–72 h process that includes trawl or hand-harvest capture, transport to, and time spent in, containment at a biomedical facility, a 30% blood extraction, and return to the point of capture (ASMFC, 1998; Leschen and Correia, 2010). Interestingly, numerous crustaceans exhibit both transient and long-term (1–4 week) behavioral (Harris and Andrews, 2005; Parsons and Eggleston, 2005; Haupt *et al*., 2006) and physiological (Vermeer, 1987; Bergmann *et al*., 2001; Ridgway *et al*., 2006; Patterson *et al*., 2007) alterations in response to similar capture stressors, with effects including altered hemolymph biochemistry (Vermeer, 1987; Ridgway *et al*., 2006), reduced immune function (Ridgway *et al*., 2006), decreased predator avoidance behaviors (Brown and Caputi, 1983: Vermeer, 1987), altered responses to stimuli (Parsons and Eggleston, 2005), reduced locomotion (Davis *et al*., 1978), and diminished or altered spawning behaviors (Smith and Ritar, 2005). The LAL harvest process compounds typical capture through an extended (up to 72 h) period of aerial exposure and substantial blood loss, and thus has the potential to effect analogous behavioral and physiological changes in *L. polyphemus*.

Immediate and long-term behavioral responses of *L. polyphemus* to the biomedical bleeding process have been little studied. Both activity levels (Rudloe, 1983) and movement velocity (Kurz and James-Pirri, 2002) have been reported to be unaffected by a hemolymph extraction performed with a minimal (30 min to 3 h) amount of aerial exposure. Interestingly, a high-stress hemolymph extraction process, which includes 48 h of aerial exposure combined with thermal stress, causes the highest mortality (Hurton and Berkson, 2006), although neither activity nor velocity alterations in response to such a process have been investigated. In addition, a salient behavioral feature of *L. polyphemus* is the

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expression of tidal activity rhythms, driven by a circatidal clock (Chabot *et al*., 2004), which facilitates successful spawning and foraging activities in the wild (Cohen and Brockmann, 1983; Barlow *et al*., 1986; Watson and Chabot, 2010). In other species, disruptions of behavioral and physiological circadian rhythms occur in response to a variety of environmental stressors, including alterations in light intensities (*Procambarus clarkii* and *Procambarus digueti*; Fanjul-Moles *et al*., 1998), decreased water quality (*Astacus astacus*; Styrishave *et al*., 1995), and trawl capture (*Nephrops norvegicus*; Aguzzi *et al*., 2005), and disruptions in circatidal rhythms occur in response to osmotic (*Ruditapes philippanarum*; Kim *et al*., 2001) or thermal stress (*Chthamalus bisinuatus*; Kasten and Flores, 2013). However, to date, the ramifications of the high-stress biomedical bleeding process on behavior and physiology of horseshoe crabs have not been well characterized.

The effects of the harvest process on hemolymph properties also have not been clearly elucidated. While *L. polyphemus* regains its blood volume within three to 30 days after being bled (Rudloe, 1983; Novitsky, 1984), restitution of amebocytes takes up to four months (Novitsky, 1984), and the length of time required for recovery of additional hemolymph constituents is unclear. Capture stress alone decreases total hemolymph protein concentration in some crustaceans (Ridgway *et al*., 2006), and this decline is correlated with reduced immune system functioning and increased susceptibility to infection in lobsters, *Homarus americanus* (Theriault *et al*., 2008). The biomedical bleeding process combines capture stress with substantial hemolymph loss, and *L. polyphemus* exhibits significantly decreased hemolymph protein concentration for at least two weeks after extraction (James-Pirri *et al*., 2012). Over 90% of *L. polyphemus* hemolymph protein is the respiratory pigment hemocyanin (Ding *et al*., 2005). In addition to aiding in the circulation of oxygen, hemocyanin may also participate in the primary immune response (Coates *et al*., 2011), and cuticle hardening and wound repair (Adachi *et al*., 2005). Poor environmental conditions, including thermal and captivity stress, accelerate hemocyanin decline in *L. polyphemus* (Coates *et al*., 2012), and therefore the combination of all these stressors is likely to produce a more dramatic decline than either of them alone.

The overall goal of this investigation was to determine whether the biomedical bleeding process induces sub-lethal physiological and behavioral effects in female horseshoe crabs during their spawning season. Our specific aims were to evaluate: (1) overall activity, linear and angular velocities of their movements, and expression of tidal rhythms for two weeks before and four weeks after a 52 h bleeding process, and (2) hemocyanin concentrations immediately prior to, and six weeks after, a 52 h bleeding process. We evaluated these parameters in *L. polyphemus* from Great Bay, NH. While this population is genetically distinct from the harvested mid-Atlantic populations, the genetic distance is low (King *et al*., 2005); further, this population has not historically been harvested for biomedical bleeding (ASFMC, 2012), and so animals were presumably naïve to the process. We performed both laboratory studies, which allowed continuous monitoring of animal activities, and an outdoor study, which enabled evaluation of bleeding impacts in a quasi-natural environment. Our results suggest that *L. polyphemus* experiences sub-lethal behavioral (reduced activity, velocity of movements, and expression of circatidal rhythms) and physiological (chronic

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hemocyanin loss) alterations in response to the bleeding process, and these should be considered when assessing the impact of this procedure on horseshoe crab populations.

Materials and Methods

2.1 Animals- Treatment Groups and Conditions

Fifty-six female horseshoe crabs were collected during high tide at spawning beaches on Adams Point, Durham, New Hampshire, from May 15–23, 2012, and their prosomal width was measured. Animals were distributed by size into four experimental groups; this distribution by size was necessary because of constraints of experimental equipment. The largest 14 animals (prosomal width: 18–23 cm) were assigned to the outdoor unrestrained (OU) group, and they were placed in tanks outside of the University of New Hampshire Jackson Estuarine Laboratory (JEL). These outdoor tanks could accommodate larger animals than could our indoor laboratory tanks. The remaining 42 animals were transported by van to Plymouth State University (PSU; trip duration was 2 h) in polyurethane coolers. The smallest 14 animals (prosomal width: 16–18 cm) were assigned to the laboratory running wheel (LRW) group; the smallest animals were selected for this group because pre-constructed running wheels could only fit animals of prosomal width less than 18.5 cm. The remaining 28 animals were equally divided between the laboratory unrestrained (LU) and laboratory communal tank (LCT) groups. Because smaller animals were selected for the LRW group, prosomal width varied significantly ($F(3,52) = 6.05$, $P = 0.002$; Table 1) across the four groups, with prosomal width in the OU and LU groups greater than that of the LRW group ($P < 0.05$), while prosomal width in the LCT group was not significantly different from any of the other groups.

2.1.1 Outdoor Unrestrained Group—The purpose of the OU group ($n = 14$; prosomal width: 19.1 ± 0.4 cm, mean ± SEM) was to monitor activity in animals exposed to a natural photoperiod and constantly replenished estuarine water. Accelerometers (Onset Computer, Pocasset, MA), set to measure acceleration (g) in the three orthogonal axes, were affixed to the prosoma of each animal using cable ties, duct tape, and cyanoacrylate (Schaller *et al*., 2010). Animals were placed in separate cylindrical wire enclosures (70 cm diameter × 48 cm height) within seven 850-L tanks (183 cm × 92 cm × 50 cm) containing approximately 15 cm of sand so animals had the opportunity to bury. Water from the estuary continuously flowed (~4 L/min) through the tanks, keeping salinity and temperature consistent with that of Great Bay, NH, and the tanks remained uncovered and exposed to the natural light/dark cycle (approximate sunrise: 5:01–5:15 am; sunset: 8:00–8:28 pm). The animals were allowed access to 2% of their body weight in diced quahogs three times a week by placing the food in the bottom of the tanks. Activity was logged via the accelerometers for two weeks prior to the biomedical bleeding process.

2.1.2 Indoor Groups at Plymouth State University—To simulate the summer photoperiod, all indoor groups were maintained under a 14:10 light/dark (LD) cycle with instantaneous photic transitions, salinity between 25 and 30 psu, and temperature between 18–21°C. Temperature and lighting conditions were continuously recorded using Vernier Labquest handheld data collection units connected to a light sensor and temperature probe

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(Vernier Software and Technology LCC, Beaverton, OR). Activity was measured in two separate laboratory groups via two different monitoring systems, enabling comparison between the two techniques for validation of results.

Laboratory Running Wheel Group: The activity of this group of 14 animals (prosomal width: 17.5 ± 0.8 cm) was monitored using "running wheels," constructed as described in Chabot *et al*. (2004, 2007). The animal was secured within the wheel with its telson sticking out through a slit. Then a polypropylene plastic golf ball was placed on the telson to prevent it from being drawn into the wheel. Cable ties were used to attach the front of the carapace to the frame. After all animals were prepared, the running wheels were distributed among four custom-made acrylic recirculating open top tanks (80 cm L × 65 cm W × 32 cm D). Wheel rotations were recorded with ClockLab Data Collection Software (Actimetrics, Wilmette, IL).

Laboratory Unrestrained Group: The activity of this group of 14 freely moving animals (prosomal width: 18.9 ± 0.3 cm) was monitored using video recording. The animals were distributed between two large (1.7 m L × .9 m W × .75 m D) tanks, each with a separate filter system. The tanks were subdivided by plastic egg grating (1 cm × 1 cm) into a total of eight arenas per tank (each 21 cm × 45 cm), and a 4 m length of waterproof red LED Ribbon Flex strip lighting (λ = 630–660 nm; LED Liquidators, Inc., Westlake Village, CA) was threaded through the egg grating in each tank to provide continuous illumination for video recording. One animal was placed into each of seven arenas per tank (one arena in each tank was excluded to house the filtration system). An infrared video camera was suspended 1 m above the tanks, and digital video recordings were obtained at a rate of one frame per 20 s using Gawker software (Piwonka, Seattle, WA). The videos were then analyzed for total distance moved, linear velocity, and angular velocity using Ethovision XT software (Noldus Information Technology Inc., Wageningen, Netherlands).

Laboratory Communal Tank Group: The 14 animals in this group were kept in one acrylic recirculating open top tank (80 cm L × 65 cm W × 32 cm D). Activity of this group was not measured; hemocyanin concentrations in control and bled horseshoe crabs of the LCT group (n = 14; prosomal width: 18.4 ± 0.4 cm) were measured from 1–2 mL blood samples taken each week, using the "Hemolymph Sampling" process detailed below.

2.2 Biomedical Bleeding Procedure

After collecting behavioral data for two weeks, 28 animals were bled using a process that approximated the standard biomedical bleeding procedure (high stress: Hurton and Berkson, 2006).

2.2.1 Laboratory Groups—The bleeding process for these groups was completed from June 1–3, 2012. Half of the horseshoe crabs from each of the LRW, LCT, and LU groups (n = 7 each) were randomly selected to undergo the bleeding process and distributed among three 50-gallon plastic barrels; the remaining 21 remained in their treatment conditions as controls. The temperature within the barrels was monitored using a Vernier Labquest with thermometer attachment during the 52 h process.

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Pre-Bleeding Procedure: To replicate the capture and transportation during a typical biomedical bleeding process, the barrels were placed on the roof of Boyd Hall at PSU for 8 h. For the first 4 h, the barrels were kept in direct sunlight to simulate time spent on the deck of a boat; during this time, temperatures reached 37°C (mean ± SD: 32.0 ± 2.9°C). For the next 4 h, the barrels were covered with cardboard and moved into shade to simulate time spent in a truck en route to a bleeding facility (26.1 ± 1.1°C). Then the covered barrels were moved indoors (20.8 ± 0.9°C) for 16 h to simulate time spent overnight at the bleeding facility and then hemolymph was withdrawn.

Bleeding Procedure: Hemolymph was extracted using the procedure of Armstrong and Conrad (2008). One person held the animal in the abdominal flexure position, exposing the arthrodial membrane of the medial dorsal surface at the joint between the prosoma and the opisthosoma, while a second person withdrew the hemolymph. The arthrodial membrane was sterilized with 70% ethanol and punctured with a 14 gauge needle. Hemolymph was collected in 50 mL conical tubes, pre-chilled on ice, until the flow stopped or the estimated 30% volume had been reached. The equation of Hurton *et al*. (2005) was used to estimate total hemolymph volume for each horseshoe crab:

$$\mathrm{H}=21.6\,\mathrm{e}^{0.1234\mathrm{P}}\,[\mathrm{H}\ =\ \text{hemolymph volume (mL)};\mathrm{P}\ =\ \text{prosonal width (cm)}].$$

Extraction volumes ranged from 30 to 75 mL (mean ± SE: 35.8 ± 4.6 mL) and were generally less than the calculated 30% volume (17.3 ± 2.0%; Table 1). The hemolymph was kept on ice until processed further.

Post Bleeding Procedure: Animals were returned to their barrels and held indoors for 24 h (19.8 ± 0.9°C) to simulate a second overnight at a bleeding facility. The barrels were placed next to a heater (24.0 ± 1.3°C) and shaken periodically for 4 h to simulate transportation by truck back to the ocean. Finally, they were returned to their treatment conditions after a total of 52 h out of water. Activity in the LU and LRW groups was recorded for the next six weeks, and weekly hemolymph samples were taken from the LCT group. Tanks were checked daily for mortalities.

2.2.2 Outdoor group—The bleeding process for the OU group took place from June 6–8 and used a treatment paradigm similar to that used on the laboratory groups, though with minor modifications to adjust for poor weather conditions. Seven horseshoe crabs (one per tank) were selected to undergo the bleeding process; their accelerometers were detached, and they were distributed between two 50-gallon plastic barrels. The barrels were first kept under a heat lamp for 4 h to simulate time spent on the deck of a boat; during this time, temperature reached 28°C (26.1 ± 2.1°C). Then the barrels were transported by van to PSU (2 h; 21.3 ± 2.7°C) and placed indoors (18.2 ± 1.7°C) overnight (16 h). Then hemolymph was extracted as described for the indoor groups and the animals were returned to their barrels and kept indoors, uncovered, for 24 h (18.0 ± 0.5°C). The barrels were transported by van back to JEL (2 h; 25.6 ± 0.3°C) and placed outdoors, covered, for the final 4 h to complete the simulation of transport back to the ocean (24.2 ± 1.1°C). Finally, the

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accelerometers were reattached and the horseshoe crabs were returned to their original tanks, after being out of water for 52 h, and their activity was recorded for the next six weeks.

The percent of hemolymph extracted varied significantly ($F(3,24) = 7.2$, $P = 0.001$; Table 1) across the four groups. Percent extracted in the OU group significantly exceeded that of the LRW and LCT groups ($P < 0.05$), while percent extracted in the laboratory unrestrained group was not significantly different from the other groups.

2.3 Hemolymph Sampling

Weekly 1–2 mL hemolymph samples were taken from all animals in the LCT group. Samples were taken from all control animals at the time of the bleeding process for the bled groups, and from all animals six weeks after the bleeding process. Hemolymph was extracted following the procedure used for the bled group, except it was collected with 25-gauge needles in 2.0-mL microcentrifuge tubes. During this process, each crab was kept out of water for no longer than 5 min.

2.4 Determination of Hemocyanin Concentrations

Hemocyanin concentrations were determined using the procedure of Coates *et al*. (2012). Samples were centrifuged for 10 min at 3000 g and 4°C, and then the supernatant (cell-free hemolymph) was stored at 4°C until analysis (1–2 days). An aliquot of hemolymph was diluted 1:100 in 0.1 M Tris-HCl buffer (pH- 7.5), and absorbance was measured at 280 nm on a UV-160 spectrophotometer (Shimadzu, Columbia, MD). Hemocyanin concentration was calculated using an absorbance of 1.39 for a 1 mg/mL hemocyanin solution in a quartz cuvette (pathlength of 1 cm; Coates *et al*., 2012).

2.5 Data Analysis

Laboratory Running Wheel Activity: The ClockLab collection system recorded the number of wheel revolutions per minute, and these data were used to generate actograms and Lomb-Scargle periodograms. The number of wheel revolutions was multiplied by the circumference of the wheel to obtain distance moved per minute, and these distances were summed to obtain distance moved per day. The daily sums were averaged over seven day intervals to obtain average daily distance during the two weeks before bleeding and the three weeks after bleeding.

Laboratory Unrestrained Activity: Video files were analyzed for distance moved (cm), linear velocity (cm/s), and angular velocity (degrees/s) at 20-s intervals using Ethovision XT software (Noldus Information Technology Inc., Leesburg, VA). Distance was summed per minute, and these values were used to generate actograms and Lomb-Scargle periodograms using ClockLab. Distance moved per day was calculated, and these sums were averaged over seven day intervals to obtain average daily distance for the two weeks before and the three weeks after the bleeding process. Linear velocity and angular velocity during periods of movement (distance moved > 5 cm per 20 seconds) were averaged for the two weeks prior to and the four weeks after the bleeding process. Linear velocity measured locomotive speed in one direction (net distance moved divided by 20 s between sampling intervals),

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while angular velocity measured rate of directional change (change in direction of movement between two consecutive samples divided by 20 s; Ethovision XT).

Outdoor Unrestrained Activity: The accelerometers provided acceleration in the three orthogonal axes each minute. The difference between successive x, y, and z coordinates was calculated, and these differences were used to calculate the net acceleration vector. These values were used to generate actograms and Lomb-Scargle periodograms. The daily percent of time active was determined by summing the number of minutes per day with a net vector exceeding 0.02 (determined by frequency histogram analysis to be the threshold value for background noise). The daily percentages were averaged over seven day intervals to obtain weekly values for the two weeks before and the three weeks after the bleeding process.

Hemocyanin Concentration: The percent of original hemocyanin remaining for each animal was calculated as the ratio of final hemocyanin concentration (six weeks post bleeding) to the original hemocyanin concentration (day of bleeding). To distinguish hemocyanin loss due to hemolymph extraction from hemocyanin decline due to other factors, the amount of hemocyanin extracted (volume of hemolymph extracted multiplied by initial hemocyanin concentration) was subtracted from the estimated total hemocyanin (initial hemocyanin concentration multiplied by estimated hemolymph volume); this value was compared to final total hemocyanin (hemocyanin concentration six weeks post-bleeding multiplied by estimated hemolymph volume). In the LCT group, rate of hemocyanin concentration decline ($mg*mL^{-1}*week^{-1}$) was calculated as the ratio of concentration difference between successive hemolymph samples to the number of weeks between samples.

2.6 Statistical Analyses

Repeated measures ANOVAs, two-way ANOVAs, mixed model ANOVAs, or Student's T-tests ($P < 0.05$) were performed using Minitab (Minitab Inc., State College, PA) to examine the effects of bleeding on physiological and behavioral parameters. Tukey's HSD post-hoc analyses ($P < 0.05$) were used to examine differences between means. Lomb-Scargle periodogram analyses were used to determine whether animals expressed significant circatidal (~12.4 h) or daily (~24 h) rhythms each week (peaks exceeding $P = 0.001$; tidal: 10–14 h range; daily: 22–26 h range; arrhythmic: no significant peaks). Mixed model ANOVAs with repeated measures in one factor were used to compare percentages of animals expressing tidal rhythms in the three activity groups and the rates of hemocyanin decline in the LCT group. Two-way ANOVAs were used to test for effects of environmental conditions (LRW, LU, and OU) and treatment (bled/control) on percent of animals expressing tidal rhythms and percent of hemocyanin remaining in the four treatment groups. Repeated measures ANOVAs were used to compare pre-bleeding activity, linear velocity, and angular velocity to that post-bleeding. Correlational and single linear regression analyses were used to determine relationships between hemocyanin decline and activity, and immediate activity to second week post-bleeding activity.

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Results

3.1 Alterations in Behavior: Biological Rhythms, Activity, and Velocity

The bleeding process affected both activity levels and expression of tidal rhythms (Figs. 1–3; Table 2). Bled animals (LRW and OU) decreased their expression of tidal rhythms during the second week post- bleeding (Table 2, Fig. 1). There was a significant interaction of the bleeding treatment by time ($F(3, 23) = 9.55$, $P = 0.005$) on the percent of animals expressing tidal rhythms. Specifically, expression of tidal rhythms in bled animals during the second week after bleeding was significantly less ($P < 0.05$) than it was in bled and control animals before bleeding, during the first week after bleeding, and during the third week after bleeding. During this second week, the percent of animals expressing tidal rhythms decreased by 83% in the OU group and by 60% in the LRW and LU groups. Significant differences between treatment conditions on the expression of tidal behavioral rhythms were not seen ($F(2,23) = 1.38$, $P = 0.305$).

In the OU group, three of seven bled animals appeared to shift activity patterns to diurnal activity during the second week after the bleeding process (Fig. 1), one appeared to shift to primarily nocturnal activity, and the remaining three did not appear exhibit a preference. In the LU group, four of six animals appeared to express diurnal activity during the second week post-bleeding period, while two animals appeared to express no preference for day/night. In the LRW group, one animal became active primarily during the day, while five animals appeared to express no preference.

Activity of the three bled groups decreased significantly after the bleeding process (Fig. 2). In the LRW and LU bled groups, there was a significant effect of time on mean daily distance moved ($F(3,12) = 3.82$, $P = 0.039$ and $F(3,15) = 3.51$, $P = 0.041$, respectively): bled animals decreased the distance they traveled during the second week after the bleeding process (Fig. 2; $P < 0.05$), while there was no effect of time on daily distance moved in the control groups (LRW: $F(3,9) = 0.52$, $P = 0.678$; LU: $F(3,15) = 0.514$, $P = 0.679$). In the OU bled group, time after bleeding also significantly affected mean daily activity ($F(3,18) = 4.02$, $P = 0.024$; Fig. 2, 3); percent of time spent active decreased ($P < 0.05$) during the second week after bleeding, while activity in the control group was not affected ($F(3,18) = 0.17$, $P = 0.92$). In the OU group, activity returned to pre-bleeding levels during the third week post-bleeding, while activity in the LRW and LU did not fully recover (Fig. 2).

In the OU group, six of seven bled animals appeared to exhibit normal to high activity levels for one to two days upon return to the water (percent of time active equaled or exceeded mean pre-bleeding levels; Fig. 3, top). This response was also seen in three of seven animals in the LU group, and one of seven animals in the LRW group. However, within the LU group, four of six animals exhibited a period of latency to initiate activity immediately after the bleeding process, with a “quiescent” period ranging 1.5 to 25.5 h (mean ± SE: 16.7 ± 5.5 h) prior to movement for four of the animals. Similarly, six of seven animals of the LRW group had a latency ranging from 2.8 to 21.6 h (8.6 ± 3.5 h) to initiate activity. In the OU group, the initial percent change in activity was significantly negatively correlated to the magnitude of the second-week activity decrease ($R^2 = 0.57$, $F(1,6) = 6.64$, $P < 0.05$; Fig. 3,

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bottom), with animals that exhibited highest initial increases in activity exhibiting larger activity decreases during week two post-bleeding.

Bled animals in the LRW and LU groups moved similar distances (LRW: 50.5 ± 10.7 m/day; LU: 62.3 ± 7.0; t(11) = 0.38, $P = 0.715$) prior to the bleeding process. During the second week after the bleeding process, LRW animals decreased activity by 66%, while LU animals decreased activity by 33%, with distance moved significantly less in the LRW than in the LU group (t(11) = 2.76, $P = 0.04$; LRW: 10.2 ± 2.9 m; LU: 42.8 ± 11.5 m). Similar to LU animals, OU animals decreased overall activity by 33% during the second week post-bleeding. Within each group, neither prosomal width nor percent of hemolymph extracted was correlated with percent reduction in activity during the second week post-bleeding for the three activity groups (prosomal width: OU: r(6) = 0.127, $P = 0.811$; LRW: r(6) = 0.361, $P = 0.55$; LU: r(6) = −0.275, $P = 0.60$; percent extracted: OU: r(6) = −0.308, $P = 0.50$; LRW: r(6) = 0.644, $P = 0.24$; LU: r(6) = –0.581, $P = 0.23$).

Linear and Angular Velocity—Linear and angular velocities were monitored in the LU group to assess changes in locomotor behaviors. While moving within the LU tank system, animals tended to exhibit three types of behaviors: traversals of the rectangular arenas, circles around the arena, or back and forth movements along one wall of the arena. Animals making both rapid traversals and circling movements exhibited high linear and angular velocity, while animals moving primarily along one side of their arenas exhibited lower velocities. During the 14 days before the bleeding process, both bled and control animals had similar linear (t(9) = 1.5, $P = 0.167$) and angular (t(12) = 1.02, $P = 0.331$) velocities. Bled animals decreased both linear (F(4,20) = 6.4, $P = 0.002$) and angular (F(4,20) = 2.99, $P = 0.044$) velocity during the first week after the bleeding process (Fig.4). While linear velocity returned to pre-bleeding levels during the third week post-bleeding, angular velocity remained suppressed (Fig. 4). In the control group, there was no effect of time on linear (F(4,24) = 0.93, $P = 0.461$) or angular (F(4,24) = 0.34, $P = 0.849$) velocity. Within the context of the LU system, the reductions in linear velocity suggest both slower locomotor rate during tank traversals and increased time spent moving along one side of the arena, while decreased angular velocity suggests slower rotational rates while circling arenas.

3.2 Alterations in Physiology

Hemocyanin—Hemocyanin loss was significantly affected by both bleeding (F(1,39) = 10.10, $P = 0.003$) and treatment condition (F(4,44) = 7.26, $P = 0.001$). Post-hoc analyses indicated that, six weeks post-bleeding, the percent of initial hemocyanin concentrations (pre-bleeding) remaining in the LRW, LU, and OU bled groups was significantly less than those of the corresponding control groups ($P < 0.05$). Further, hemocyanin percent losses in the LRW, LU, and LCT groups significantly exceeded those of the outdoor unrestrained group ($P < 0.05$; Fig. 5). The LRW bled and LU bled groups lost approximately 70% of the original concentration of hemocyanin, while the OU group lost 40%. On the day of the bleeding process, hemocyanin concentration did not differ significantly between bled and control animals of the four treatment groups (F(7,37) = 1.5, $P = 0.2$; data not shown).

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When amount of hemocyanin lost as a result of the bleeding process was subtracted from initial hemocyanin levels, the hemocyanin reductions that occurred during the six weeks after the bleeding process did not differ between bled and control animals for the four groups combined ($F(1,37) = 2.72$, $P = 0.107$; data not shown), nor between bled and control animals within each treatment group ($F(3,37) = 0.84$, $P = 0.479$). Treatment conditions, however, affected total hemocyanin loss ($F(3, 37) = 9.98$, $P < 0.001$); specifically, subsequent losses in the OU group (bled and control) were significantly less than those laboratory groups.

In the LCT group, there was a significant effect of the bleeding process on hemocyanin concentration loss ($F(1, 32) = 10.95$, $P = 0.002$; data not shown), with a significant interaction of the bleeding treatment by time ($F(3, 32) = 6.32$, $P = 0.002$). Particularly, highest hemocyanin reductions in bled animals occurred immediately after the bleeding process (bled: 13.44 ± 2.8 $mg*mL^{-1}week^{-1}$, control: 2.31 ± 1.4 $mg*mL^{-1}$ $week^{-1}$). This immediate loss was significantly greater than that in both bled and control animals before bleeding (bled: 4.48 ± 1.4 $mg*mL^{-1}$ $week^{-1}$, control: 1.89 ± 2.1 $mg*mL^{-1}$ $week^{-1}$) and during weeks 2–6 post bleeding (bled: 2.87 ± 0.7 $mg*mL^{-1}$ $week^{-1}$, control: 2.17 ± 0.7 $mg*mL^{-1}$ $week^{-1}$).

Mortality—There were five total mortalities (18%) among bled animals (Table 1), with 42% mortality in the LCT, 0% mortality in the OU group, and 14% mortality in the LRW and LU groups. Mortalities in the LCT and LU groups occurred on the third day after return to water, while the mortality in the LRW group occurred on day two. The mean percent of hemolymph extracted in the five animals that died (15.9 ± 1.8%) did not significantly differ from that extracted from the remaining animals (19.8 ± 1.2%; $t(27) = -1.85$; $P = 0.09$).

Discussion

In this study, we found that the biomedical bleeding process causes several sub-lethal behavioral and physiological changes. The most obvious behavioral effects were immediate (within one week) decreases in walking speed and latent (one week post) reductions in both overall activity and the expression of tidal rhythms. The greatest impact of bleeding on *Limulus* physiology was an immediate and sustained decline in hemocyanin concentrations.

Behavioral Effects

Activity Levels—The bleeding process caused, after a one-week delay, a period of reduced activity: during the second week after the bleeding process, animals decreased activity (distance moved and percent of time active) between 33% and 66%. Similarly, the stone crab (*Menippe mercenaria*, Davis *et al*., 1978) decreases activity for ten days after the fishery practice of declawing. Further, discarded (undersized) Norwegian lobsters (*Nephrops norvegicus*; Harris and Ulmestrand, 2004) exhibit diminished swimming performance for eight to fifteen days following harvest stress (trawl capture plus 1 h of emersion), activity reductions attributed to the energy costs of initial activity during capture, effects of aerial exposure, and recovery from trawl-related injuries. However, in *N. norvegicus*, the reduction in swimming ability is apparent immediately after harvest processes, a contrast to what we found in *L. polyphemus*.

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While it is likely that the period of reduced activity in *L. polyphemus* is the result of the combination of blood loss, thermal stress, desiccation, and aerial exposure, the reason for the one week delay prior to a decline in activity is not clear. Animals varied in their initial behavioral responses to the bleeding process, with six of seven animals in the OU group, four of six animals in the LU group, and one of six animals in the LRW group exhibiting high activity levels immediately after re-immersion (Fig.1, LU bled, OU bled; Fig. 3) and then, after a 1 week delay, exhibiting a reduction in activity. The significant negative correlation between the immediate activity increase and the second week activity decrease in the OU group may suggest that the second week activity deficit is possibly a response to the initial damage from the bleeding process compounded by the depletion of energetic resources that may occur during initial high activity output. This initial activity may be a manifestation of an escape response (*L. polyphemus*, Rudloe and Hernnkind, 1976); alternatively, it may reflect disorientation incurred by the bleeding process (*L. polyphemus*; Kurz and James-Pirri, 2002) or foraging efforts to replace lost energy reserves (*Cancer pagurus*; Patterson *et al*., 2009). In contrast, the second-week activity decrease is likely to be due to an impact of the bleeding process that is more long-term; however, future work is needed to clarify the mechanisms responsible.

These results conflict with those of Rudloe (1983), who found no difference in overall activity between bled and control animals during the 28 days following hemolymph extraction. Several reasons may account for this discrepancy. Firstly, Rudloe (1983) examined activity in animals after a bleeding process that only included 3 h of aerial exposure, while our 52 h procedure more closely resembles the procedure typically used to extract blood for LAL. Secondly, in the Rudloe (1983) study, activity was assessed by the number of deflections of two rods suspended above a pool containing several animals, and thus individual activity was not examined; in contrast, our three separate activity monitoring systems enabled continuous collection of activity data from each individual animal, with the lowest resolution of one sample/minute. Finally, Rudloe (1983) compared activity between bled and control animals during a 2 h window each day over 28 days, while we used several weeks of continuous activity when making comparisons. Overall, our study both more closely replicated an actual biomedical bleeding process and allowed a closer monitoring of individual behaviors.

The degree of activity decline and recovery may have been differentially affected by treatment conditions in this study. Specifically, that complete recovery of activity levels only occurred in the OU group was most likely due to the fact that they had access to food, while the LU and LRW groups were not fed. Starvation both prolongs stress recovery periods (oyster, *Crassostrea gigas*, Li *et al*., 2009b) and decreases locomotion (*Cancer pagurus*, Ansell, 1973). Additionally, though the smaller animals of the LRW group exhibited the same trend in activity decline as did animals of both unrestrained groups, they appeared to have a larger activity loss (66%). However, among controls, LRW animals had the largest decreases in hemocyanin concentration, suggesting that conditions of the LRW system may have been more stressful than those of the LU and OU systems. As such, whether the smaller size of these animals or the experimental conditions affected the magnitude of the activity decline cannot be determined by this study, and it would be useful

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to compare activity of animals of varied sizes that are maintained in the same data collection system.

Expression of Tidal Rhythms—Decreased expression of tidal rhythms occurred contemporaneously with the decrease in activity levels. In the OU group, the transition from bimodal to unimodal behavioral patterns appeared to be due to a temporary disappearance of one of the two daily bouts of activity (four of five animals; Fig. 1, OU bled), with three animals appearing to be primarily active during the daytime high tide and one animal appearing to be active during the nighttime high tides. These transitions may serve as means of energy conservation, and may be directly related to the decreased overall activity during the second week after the bleeding process. Similarly, concomitant decreases in expression of tidal rhythms and overall activity occurs when *L. polyphemus* is exposed to decreased water temperature (4–11°C; Chabot and Watson, 2010). Additionally, in our laboratory animals that initially expressed primarily daily patterns of activity, the duration of the activity bout shortened during the second week after the bleeding process (Fig. 1, LU bled), and the loss of rhythmicity that occurred in three of the bled laboratory animals appeared to be a correlate of reduced overall activity.

Velocity—In the LU group, both the linear and angular velocity of the animals' movements significantly decreased during the first week after the bleeding process. Similarly, the great scallop, *Pecten maximus*, has significant reductions in swimming velocity during the first 24 h after dredge capture and aerial exposure (20 min; Jenkins and Brand, 2001). This transient effect is attributed to physical exhaustion after capture (Jenkins and Brand, 2001), while, in other species, immediate behavioral alterations appear to be caused by the physical trauma of harvest practices (Stoner, 2012a, b). However, the factors responsible for these immediate behavioral changes in *L. polyphemus* deserve further investigation.

Our linear velocity findings contrast with those of Kurz and James-Pirri (2002), who found no significant difference between movement rates of bled and non-bled female *L. polyphemus* returned to Nauset Estuary (Cape Cod, MA) after hemolymph extraction. This discrepancy could have been caused by the more intensive bleeding procedure we used: Kurz and James-Pirri (2002) performed a hemolymph extraction with a maximum of 30 min aerial exposure, while we used a high-stress bleeding treatment more closely analogous to the biomedical bleeding procedure (Hurton and Berkson, 2006). The heightened physiological impact of the high-stress treatment (higher mortality; Hurton and Berkson, 2006) is attributed to the synergistic effect of multiple stressors (hemolymph extraction, thermal stress, and aerial exposure); similarly, the presence of these compound stressors may evoke a heightened behavioral effect. However, Kurz and James-Pirri (2002) also observed that the bled females lacked a directional preference towards spawning beaches, contrasted to the directed movement patterns of controls towards these spawning beaches. Kurz and James-Pirri (2002) suggested this behavioral discrepancy may be caused by disorientation incurred by the bleeding process. Whether the velocity and activity changes we documented were laboratory manifestations of the movement patterns Kurz and James-Pirri observed in the wild remains to be determined and further work is also necessary in

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order to ascertain the connection between bleeding stress and relatively long-term alterations in behavior.

Physiological Effects

Hemocyanin Concentration Decrease—The bleeding process caused a prolonged period of hemocyanin loss: six weeks after the bleeding process, three of the bled groups exhibited significantly greater losses in hemocyanin concentration than the control animals in those groups (Fig. 5). Despite feedings, bled animals in the OU had only 60% of their original hemocyanin concentration six weeks after being bled. In contrast, OU controls lost just 10% of their original hemocyanin concentration. As the outdoor group experienced the most naturalistic conditions (freshly flowing bay water, sediment, and access to food), these results suggest that hemocyanin recovery in the wild may require a prolonged (>6 week) period. Similarly, James-Pirri *et al*. (2012) found significantly reduced total hemolymph protein in bled animals, compared to both wild caught and captive controls, 17 days after bleeding (James-Pirri *et al*., 2012), with hemolymph protein of bled animals approximately 20% less than that of controls. As hemocyanin constitutes over 90% of total hemolymph protein (Ding *et al*., 2005), our results support the suggestion that the bleeding process has a lingering impact on *L. polyphemus* hemolymph quality (James-Pirri *et al*., 2012), with no indication of recovery over six weeks even in animals that were fed.

The fact that the highest hemocyanin reductions occurred in the laboratory groups may be due to the both captivity stress and the lack of feeding. Not surprisingly, in the LCT group, hemolymph extraction caused significant hemocyanin loss during the first week after the process, indicating an immediate effect of the process of hemolymph quality. However, rates of decline between bled and control animals were similar during the following weeks, suggesting subsequent losses were most likely due to captivity stress (Coates *et al*., 2012); similarly, once hemocyanin loss due to hemolymph extraction was subtracted, net hemocyanin losses in all groups during the weeks following the extraction were equal, further suggesting that captivity stressors perpetuated these additional losses. Within the laboratory groups, the lack of feeding most likely exacerbated hemocyanin loss, as starvation can decrease total hemolymph protein through hemocyanin catabolism (*Cancer maenas*, Uglow, 1969) and slow protein synthesis (Li *et al*., 2009; Sokolova *et al*., 2012), an energetically demanding process (Hand and Hardewig, 1996).

Mortality Rates—The 18% total mortality across our four bled groups is lower than that reported by Leschen and Correia (30%; 2010) and by Hurton and Berkson (29%; 2006) for females that underwent either a 40% blood extraction (Hurton and Berkson, 2006) or a hemolymph extraction at a biomedical company (Associates of Cape Cod; Leschen and Correia, 2010) combined with 24–48 h aerial exposure. The low mortality in the LU and LRW groups, and the lack of mortality in the OU group, may be related to the percent of hemolymph we extracted (15–28%). Similarly, Hurton and Berkson (2006) found 0–6% mortality after a 48 h high stress process with 20–30% hemolymph extraction. However, the five deaths in our experiment appeared to be unrelated to percent of hemolymph extracted, with mean percent extracted for these five animals within the range of the overall mean extraction of 19.8 ± 1.2%. Additionally, the magnitude of the second week activity change

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did not appear to be related to the amount of hemolymph extracted, suggesting that, possibly, additional factors of the process (for example, air exposure or thermal stress) may be responsible for the observed behavioral and physiological effects.

The apparent variation in mortality among our four groups may be related to treatment conditions, notably the presence of feeding in the OU group and the weekly blood samples in the LCT groups. However, the disparate degrees of thermal stress in the bleeding processes may have also affected mortality: the laboratory groups experienced a maximum of 37°C while the outdoor unrestrained group experienced a maximum of 28°C. Thermal stress alone influences mortality and vigor in *Liocarcinus depurator* (Giomo *et al*., 2008) and *Nephrops norvegicus* (Lund *et al*., 2009), and, possibly, the higher temperature in our laboratory groups partially accounts for the increased mortality. The latency to initiate activity that occurred in 11 of the 14 animals of our laboratory groups may similarly be related to the degree of thermal stress these animals experienced, with both increased desiccation and accumulation of metabolic waste products potentially responsible for limiting activity until animals regained sufficient water volume. Both length of emersion (*Pandalus platyceros*, Stoner, 2012) and degree of thermal stress are positively correlated to degree of immediate behavioral and physiological impairments post-exposure in *Panulirus cygnus* (Paterson *et al*., 2005), *Nephrops norvegicus* (Ridgway *et al*., 2006), and *Homarus americanus* (Basti *et al*., 2010), and it would be useful to further investigate the importance of these variables on post-harvest behavior of *L. polyphemus*. Importantly, both the percent of hemolymph we extracted and the degree of stress to which we exposed the animals may be less than that of standard biomedical practices (ASMFC, 1998; Leschen and Correia, 2010), and the behavioral effects that we observed may underestimate the effects of a complete biomedical bleeding process with a full 30–40% blood extraction.

4.3 Ecological Implications

The changes we observed in activity levels, movement velocity, and expression of tidal rhythms may interfere with daily *L. polyphemus* activities, which would be particularly pronounced during the spawning season. Spawning necessitates several energetically costly trips to the intertidal zone (Leschen *et al*., 2006); larger females tend to make more excursions to the intertidal zone, often making multiple trips within the same week (Leschen *et al*., 2006). An activity deficit, such as that caused by biomedical bleeding, may either influence the number of those trips, or it may influence the timing of those trips. In the case of the latter, females may delay spawning activity while they are recuperating, and this could reduce their spawning output. In addition, modifications in the expression of tidal rhythms may alter the timing of excursions to mating beaches and cause a reduction in the probability they would find males with which to mate. As females are preferentially harvested (76%; Rutecki *et al*., 2003), these behavioral alterations during the spawning season may partially account for declining populations in heavily harvested regions (James-Pirri, 2012), specifically the declining proportions of females at spawning beaches (1 female: 8.5–14 males in Pleasant Bay), reduced egg abundances (James-Pirri, 2012), and the occurrence of single females attempting to spawn (James-Pirri, 2012).

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The extended periods of low hemocyanin levels that we found may impact *L. polyphemus* fitness in the natural habitat. Hemocyanins have multiple physiological functions in invertebrates, including sclerotization and maintenance of cuticle integrity (Adachi *et al*., 2005; Terwilliger, 2007), wound repair, osmoregulation (Paul and Pirow, 1998), and involvement in the immune response (Coates *et al*., 2011). Reductions of this protein, combined with a reported four month deficit in amebocytes caused by the bleeding process (Novitsky, 1984), may result in a weakened organism, one that is both less able to contend with additional stresses and that exhibits increased susceptibility to infection. Further, the sustained declines in hemocyanin concentration that we found may partially account for the increased (10–11%) probability of mortality during the first two years post-bleeding in animals returned to the wild (Rudloe, 1983).

In summary, *L. polyphemus* females have decreased overall activity and expression of tidal rhythms during the second week after bleeding, decreased linear and angular movement velocities in the first week after the bleeding process, and long-term (>6 week) declines in hemocyanin concentrations. These results suggest that *L. polyphemus* experiences sub-lethal effects of the bleeding process, which, along with high mortality rates in females (Hurton and Berkson, 2006; Leschen and Correia, 2010), may partially account for the changing population characteristics in areas of heavy biomedical harvest. Whether these behavioral and physiological changes occur, or are possibly heightened, in the wild deserves further investigation in order to fully assess the implications of the harvest process for *L. polyphemus* spawning behaviors. Maintenance of populations of *L. polyphemus* is essential not only for the ecosystem as a whole, including subsistence of shorebird populations (Baker *et al*., 2004), but also for several commercial sectors. The use of horseshoe crabs in the production of LAL is of global importance, and a continued harvest is important in meeting the demands for LAL. However, to maintain the integrity of the stock needed to supply the industry, adaptive or flexible management strategies may need to be considered. In areas of population decline, harvest limits during the spawning season may help to minimize any potential population-level consequences incurred by individual behavioral and physiological changes.

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Abbreviations

LAL (Limulus Amebocyte Lysate)

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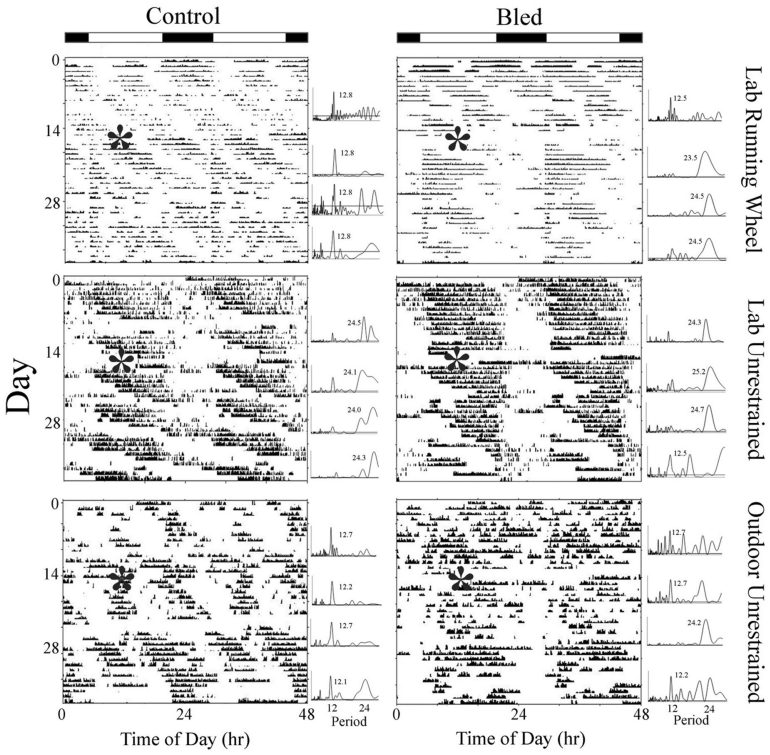


Figure 1. The effects of bleeding on locomotor activity and rhythms in representative *L. polyphemus*

Larger panels: Actograms are double-plotted, with size and position of black marks indicating the intensity and timing of activity. Asterisks indicate the start of the bleeding process; in the control actograms, the start is marked to facilitate comparison. The LD cycle (14:10) is indicated by light/dark bars at the top. Smaller panels: Lomb-Scargle periodograms to the right of each actogram indicate significant rhythms of activity during successive intervals; horizontal line above x-axis indicates $P = 0.001$. Number next to peak indicates most significant period of activity within circatidal (12–14 h) or circadian (22–16 h) range.

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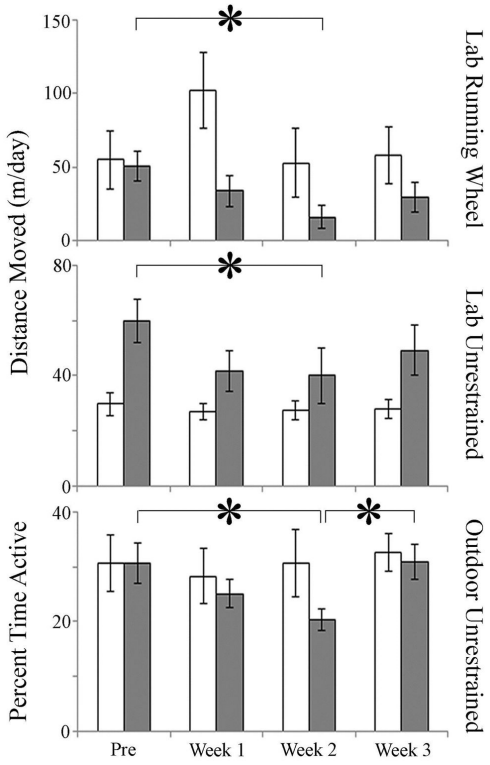


Figure 2. Effects of bleeding on activity (mean ± SEM) in the Laboratory Running Wheel, Laboratory Unrestrained, and Outdoor Unrestrained groups

White-Control; Grey-Bled. * - $P < 0.05$. Pre= 2 weeks before bleeding; Weeks 1–3= post-bleeding.

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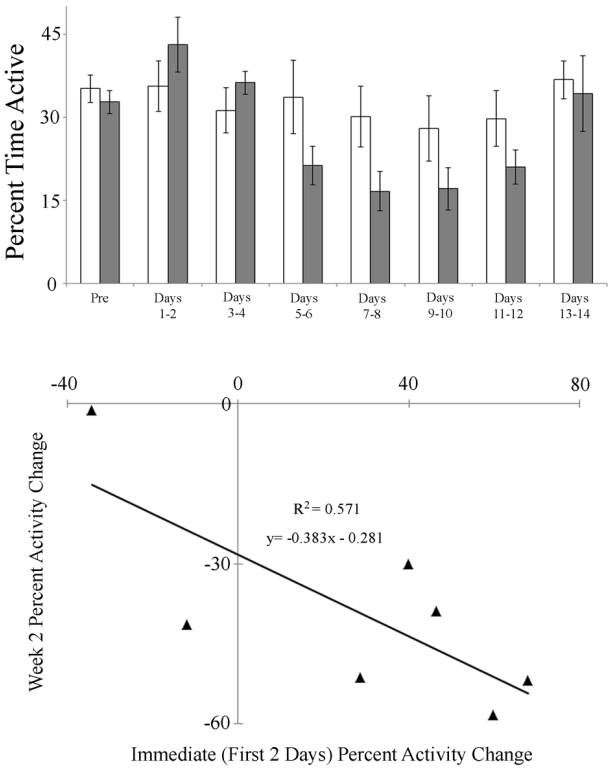


Figure 3. Effects of bleeding on activity (mean ± SEM) in the Outdoor Unrestrained group

Top: Mean activity; White-Control; Grey-Bled. Pre= 2 days before bleeding; Days 1–14 = post-bleeding. **Bottom**: Relationship between activity percent change during the first two days post-bleeding to activity percent change during the second week post bleeding.

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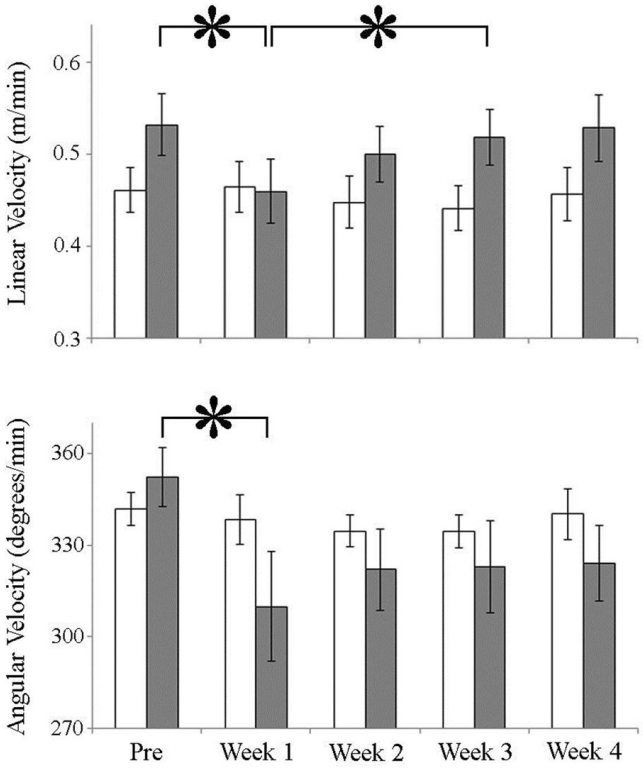


Figure 4. Effects of bleeding on linear and angular velocity in the Laboratory Unrestrained group

White bars: controls; grey bars: bled; *- $P < 0.05$. Pre= 2 weeks before bleeding; Weeks 1–4= post-bleeding.

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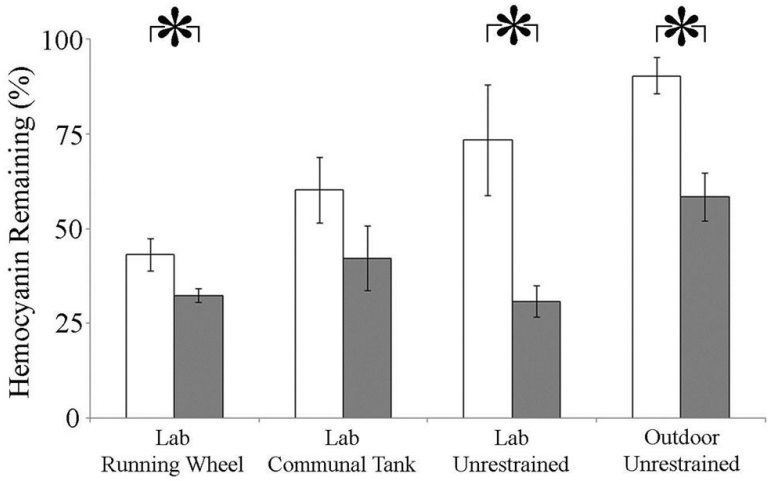


Figure 5. Percent of original hemocyanin concentration remaining six weeks post-bleeding
White bars: controls; grey bars: bled. *- $P < 0.05$.

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Table 1

Size, amount of hemolymph extracted, and mortality in the four female bled groups.

Treatment	Prosomal Width (cm)	Extracted Hemolymph Volume (mL)	Estimated Percent Extraction	Total Mortality	Percent Mortality
Lab Running Wheel	17.5 ± 0.8	28.9 ± 4.7	15.5 ± 2.5	1	14
Lab Unrestrained	18.9 ± 0.3	47.6 ± 7.0	21.0 ± 3.0	1	14
Outdoor Unrestrained	19.1 ± 0.4	64.4 ± 2.8	28.1 ± 1.1	0	0
Lab Communal Tank	18.4 ± 0.4	29.0 ± 4.9	14.2 ± 2.4	3	42

Values are mean ± SEM; $n = 7$ per group. Estimated percent extraction determined by comparing actual amount extracted to expected hemolymph volume, calculated using prosomal width.

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Table 2

Percent of *L. polyphemus* expressing tidal and daily rhythms (τ ± SEM) before and after the bleeding process.

Experimental Group	Rhythm Type	Pre	Week 1 Post	Week 2 Post	Week 3 Post
Lab RW Control	Tidal	86% (12.6 ± 0.3)	71% (12.1 ± 0.2)	57% (12.4 ± 0.2)	57% (12.3 ± 0.3)
	Daily	14% (23.8)	29% (23.0 ± 0.2)	43% (23.9 ± 0.7)	43% (24.6 ± 0.1)
Lab RW Bled	Tidal	83% (12.5 ± 0.1)	83% (12.5 ± 0.3)	33% (12.3 ± 0.2)	83% (12.5 ± 0.2)
	Daily	17% (24.3)	17% (23.5)	51% (24.3 ± 0.1)	17% (24.6)
Lab Unrestrained Control	Tidal	71% (12.6 ± 0.3)	57% (12.0 ± 0.2)	57% (12.3 ± 0.2)	71% (12.6 ± 0.3)
	Daily	28% (24.1 ± 0.4)	42% (23.3 ± 0.4)	43% (24.3 ± 0.3)	28% (25.0 ± 0.8)
Lab Unrestrained Bled	Tidal	83% (12.3 ± 0.1)	67% (12.7 ± 0.2)	33% (12.4 ± 1.0)	83% (12.5 ± 0.2)
	Daily	17% (23.2)	33% (24.5 ± 0.8)	51% (24.0 ± 0.2)	17% (23.8)
Outdoor Control	Tidal	86% (12.5 ± 0.1)	100% (12.2 ± 0.2)	86% (12.6 ± 0.2)	71% (12.2 ± 0.1)
	Daily	14% (26)	0%	14% (23.9)	29% (24.0 ± 0.5)
Outdoor Bled	Tidal	86% (12.7 ± 0.2)	86% (12.5 ± 0.1)	14% (11.2)	86% (12.3 ± 0.1)
	Daily	14% (23.7)	14% (23.1)	71% (24.4 ± 0.2)	14% (24.9)

Exhibit E

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Effects of the Biomedical Bleeding Process on the Behavior of the American Horseshoe Crab, *Limulus polyphemus*, in Its Natural Habitat

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Abstract. Horseshoe crabs are harvested by the biomedical industry in order to create *Limulus* amebocyte lysate to test medical devices and pharmaceutical drugs for endotoxins. Most previous studies on the impacts of the biomedical bleeding process on horseshoe crabs have focused on mortality rates and sublethal impacts in the laboratory. In this study, we investigated the effects of the bleeding process on the behavior of horseshoe crabs after they had been released back into their natural environment. A total of 28 horseshoe crabs (14 control and 14 bled) were fitted with acoustic transmitters and released into the Great Bay Estuary, New Hampshire, during the spring of 2016. The acoustic tags transmitted information about the activity and depth of each animal, and these data were logged by an array of passive acoustic receivers. These data were collected from May to December 2016 and from March to October 2017. Bled animals approached mating beaches less than control animals during the first week after release, with the greatest differences between bled and control females. Bled animals also remained significantly deeper during the spawning season than control animals. However, overall, bled and control animals expressed similar biological rhythms and seasonal migrations. Thus, it appears as if the most obvious impacts of the bleeding process take place during the first one to two weeks after crabs are bled.

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Abbreviations: BMP, best manufacturing process; GBE, Great Bay Estuary; IO, interocular; JEL, Jackson Estuarine Laboratory; LAL, *Limulus* amebocyte lysate.

Introduction

The American horseshoe crab, *Limulus polyphemus*, is an ecologically and economically important species found in bays and estuaries along the Atlantic coast of North America, including the Great Bay Estuary (GBE), New Hampshire. Horseshoe crabs play an important ecological role as bioturbators, as a result of foraging for food (Krauter and Fegley, 1994; Lee, 2010); and their eggs are a vital food source for 425,000 to 1 million migratory shorebirds (Walls *et al.*, 2002; Botton *et al.*, 2010). They are also harvested for use as bait for the eel and whelk fisheries (ASMFC, 1998, 2012) and for their blood, which is used to create *Limulus* amebocyte lysate (LAL) (Novitsky, 2009). LAL is used in the biomedical industry to test medical devices, vaccines, and pharmaceutical drugs for pathogenic gram-negative bacteria (Novitsky, 2009; Chen and Mozier, 2013).

Currently, while quotas and regulations have been placed on the bait fishery (ASMFC, 2012), the biomedical fishery remains fairly unrestricted; and harvest rates continue to increase in certain areas (ASMFC, 2013), which could have deleterious effects on populations of this valuable marine species. A quota system and several complete closures of coastal waters have been implemented for harvesting horseshoe crabs for the eel and whelk fisheries (ASMFC, 1998, 2012), and this led to a significant decrease in the commercial harvest levels of horseshoe crabs, from around 2 million crabs in 2000 to 600,000–700,000 crabs in 2014 (ASMFC, 2013). In contrast, the number harvested for the biomedical industry continues to increase, with levels climbing from 340,000 crabs in 2004 to 610,000 crabs in 2012 (ASMFC, 2013).

With the growing demand for LAL as the global population expands, medical advancements improve, and medical needs increase, it is critical to understand the consequences

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of the biomedical bleeding industry on horseshoe crabs' fitness and population dynamics. The capture process for this industry includes multiple stressors, such as air exposure (time on docks, boats, and trucks) and warm temperatures (on boat decks during the summer or in poorly temperature-controlled facilities and transport vehicles). In addition, the blood extraction process itself can compromise the health of the horseshoe crab, because ~30% of the estimated blood volume of individual horseshoe crabs is extracted (James-Pirri *et al.*, 2012). Female horseshoe crabs are preferentially chosen for this process because of their larger size and subsequently greater blood volume (Rutecki *et al.*, 2004; James-Pirri *et al.*, 2012); this has led to skewed sex ratios in some areas (Leschen and Correia, 2010). Each of the four major biomedical companies that bleed horseshoe crabs has slightly different collection, handling, and bleeding processes; and the extent to which they follow best manufacturing practices (BMPs) likely varies, depending on region. These BMPs include keeping them moist, avoiding bleeding injured animals or those that can be identified as having been bled before, and returning them to their point of capture within 24 hours.

Mortality rates associated with the bleeding process range from 5% to 30% (Rudloe, 1983; Thompson, 1998; Walls and Berkson, 2000, 2003; Kurz and James-Pirri, 2002; Hurton and Berkson, 2006; Leschen and Correia, 2010; Anderson *et al.*, 2013), with a differential mortality rate between sexes (15% mortality in males and up to 29% in females; Leschen and Correia, 2010; James-Pirri, 2012). Sublethal impacts include delayed blood volume recovery, reduced blood protein levels, and behavioral deficits. Specifically, Novitsky (2009) found that in laboratory holding tanks it takes three to seven days for a bled horseshoe crab to regain its total blood volume and up to four months for amebocytes to return to baseline levels. Captive bled animals exhibit significantly lower blood protein values, signifying that biomedical bleeding may have prolonged impacts on horseshoe crab physiology; and bled crabs released back into their natural environment displayed a more random pattern of movements than control animals (Kurz and James-Pirri, 2002; James-Pirri *et al.*, 2012). Finally, Anderson *et al.* (2013) found changes in the bled horseshoe crab's activity levels, expression of circatidal rhythms, linear and angular movement velocities, and hemocyanin levels.

Although the harvest process used by the biomedical fishery is considered low impact and classified as "minimally harmful to horseshoe crabs" (ASMFC, 2012), the aforementioned detrimental effects could alter population dynamics and could lead to long-term declines (Krisfalusi-Gannon *et al.*, 2018). For example, because females are preferentially bled and because there is a higher mortality rate in females, this could lead to an overall decline in female fecundity and altered sex ratios (Le Moullac and Haffner, 2000; James-Pirri *et al.*, 2005; Leschen *et al.*, 2006; Leschen and Correia, 2010). The sublethal effects of biomedical bleeding on activity levels, expression of tidal rhythms, and movement velocities (Anderson *et al.*, 2013) may disrupt activities such as foraging and spawning and may reduce crabs' ability to find mates and appropriate spawning beaches, thus leading to declines in reproductive output (Powers and Barlow, 1985; Barlow *et al.*, 1986, 2001; Herzog *et al.*, 1996; Barlow, 2001). Finally, extended periods of reduced hemocyanin levels may cause additional respiratory stress and increased susceptibility to infection because hemocyanin plays a major role in immune function and wound repair (Adachi *et al.*, 2005; Coates *et al.*, 2011).

With the exception of a study by Rudloe (1983) on the mortality rates of bled animals and a study by James-Pirri *et al.* (2012) on the impacts of bleeding on horseshoe crab orientation, all relevant studies regarding biomedical bleeding effects on horseshoe crabs have been carried out in the laboratory. Therefore, the major goal of this project was to determine the behavioral and physiological effects that the bleeding process has on horseshoe crabs that are released back into their natural environment. The animals in this study were collected from, and released back into, the GBE. This population of horseshoe crabs has not been previously harvested for biomedical bleeding (ASMFC, 2012), and a great deal is already known about the behavior of horseshoe crabs in this estuary. For example, Schaller *et al.* (2010) and Watson *et al.* (2016) found that horseshoe crabs remained in GBE year-round but that they changed depths and locations in the estuary as temperatures changed throughout the year. In the spring (March–April), when water temperatures exceeded 10–11 °C, animals traveled to shallower areas and moved to spawning beaches at high tides. After spending the summer and early fall scouring the mudflats for food, they moved down the estuary into deeper waters in the late fall to overwinter. If bled horseshoe crabs express these same patterns of behavior, then we can conclude that the bleeding process does not impact them when they are released back into their natural habitat.

In this study, before being released into GBE, designated animals underwent the bleeding process; then all animals, both bled and controls, were fitted with acoustic transmitters to monitor their movements, the times when they were active, and their preferred depths. These data were collected for about two years and were used to discern whether the bleeding process had an impact on spawning activity, the expression of daily and tidal rhythms, overall activity and distances traveled, and seasonal migrations.

Materials and Methods

Animal collection and tagging

A total of 28 (14 male, 14 female) healthy adult American horseshoe crabs, *Limulus polyphemus* (Linnaeus, 1758), were hand collected during high tide from a spawning beach on Adams Point, Durham, New Hampshire, in May 2016 (Fig. 1). All captured crabs were brought back to the University of New Hampshire's Jackson Estuarine Laboratory (JEL) and held in flow-through estuarine-water tanks until they under-

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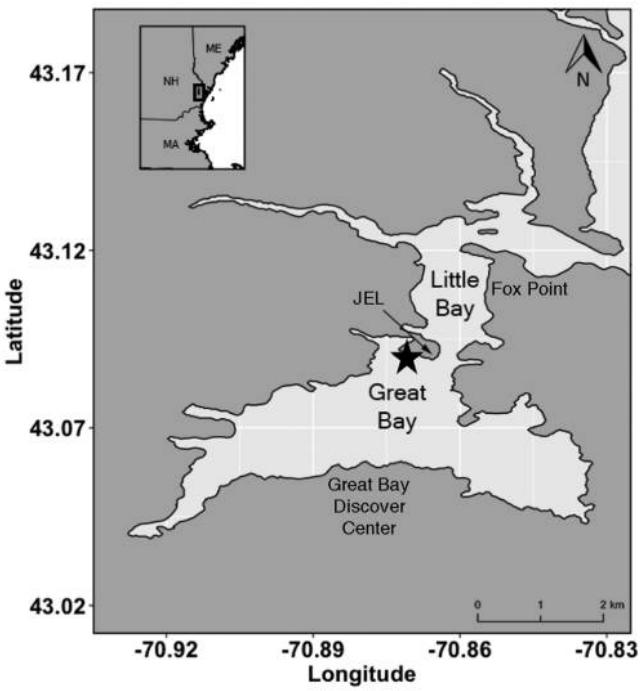


Figure 1. Map of the study location in the Great Bay Estuary, New Hampshire. The star represents the collection and release site of horseshoe crabs at Adams Point, Durham, New Hampshire. The arrow indicates the location of the Jackson Estuarine Laboratory (JEL)

went their designated treatment. Half of the animals (7 males: inter-ocular [IO] width = 8.21 ± 0.61 cm [SD]; 7 females: IO width = 11.56 ± 0.52 cm) were used as controls, while the remaining half (7 males: IO width = 8.31 ± 0.47 cm; 7 females: IO width = 11.42 ± 0.63 cm) were bled according to the industry standard procedures typically followed by the biomedical bleeding facilities, as outlined below (see *Bleeding procedure*). However, it should be noted that these procedures might vary from facility to facility and from state to state.

After treatments (bleeding or not), all horseshoe crabs were fitted with VEMCO V13AP ultrasonic transmitters (69 kHz, 147-dB low-power output, 13-mm diameter, 48-mm length, 6.5 g in water, estimated battery life of ~530 days; VEMCO, Bedford, Nova Scotia, Canada). The V13AP transmitters were programmed to transmit acceleration and depth data at random intervals about every three minutes. They were also programmed to turn off in December 2016 and then turn back on in March 2017. A transmitter was attached to the dorsal carapace of each individual, using the following method. First, it was superglued into a piece of plastic tubing that had two cable ties attached to it. The cable ties were then affixed to the carapace by using small screws. Finally, duct tape was superglued over the entire harness to ensure that the fixture would not become caught on underwater obstructions. In addition, male claspers were secured in the closed position with cyanoacrylate glue to eliminate their ability to attach to females. This ensured that data from males represented their activities and not those of a female to which they were attached. After the transmitters were attached, the animals were released into the GBE at the same spawning beach where they had been previously collected.

Bleeding procedure

Pre-bleeding treatment. The bleeding process, replicating industry standard procedures, took a total of three days (May 13–15, 2016). Half of the 28 horseshoe crabs (n = 14, 7 males, 7 females) were randomly selected to undergo the bleeding procedure. The animals in this treatment group were evenly distributed between two 50-gallon plastic barrels. HOBO temperature loggers (Onset Computer Corporation, Bourne, MA) were placed in each of the barrels to record temperature. The control animals (7 males, 7 females) remained in the flow-through tanks at JEL (14.1 ± 1.4 °C, mean ± SD) until transmitters were attached, and then they were released at the same location where they had been collected, which was also the same location where the bled animals were released.

The 50-gallon barrels with the treatment animals were placed outside of JEL in direct sunlight for 4 h, or next to a space heater in the JEL greenhouse (depending on the temperature and ambient sunlight during the selected day), to replicate the duration of time spent on the deck of a boat or a dock prior to transport to biomedical facilities. The average temperature that the animals experienced during this time was 32.6 ± 2.7 °C. After the first 4 h, the barrels were placed in the back of a car and were driven for an additional 4 h, to simulate time spent in a truck traveling to a bleeding facility (23.2 ± 1.7 °C). After these 4 h, the barrels were placed indoors at JEL for 16 h, to simulate time spent overnight at a bleeding facility (20.7 ± 0.6 °C). Finally, after 16 h, hemolymph was extracted as described below.

Hemolymph extraction. Hemolymph was extracted following the procedure of Armstrong and Conrad (2008), with modifications from Anderson *et al.* (2013). The arthrodial membrane between the prosoma and the opisthosoma of each horseshoe crab was exposed, and the hinge joint was sterilized with 70% ethanol. An 18-gauge syringe needle was inserted into the membrane, and hemolymph was collected in pre-chilled 50-mL conical tubes until 30% of total hemolymph volume had been reached or until the blood flow stopped. Total hemolymph volume for each individual was calculated using the following equation from Hurton *et al.* (2005):

$$H = 25.7\, e^{0.1928(IO)} \quad [H = \text{hemolymph volume (mL)};\ IO = \text{interocular width (cm)}].$$

Post-bleeding treatment. To minimize the amount of handling the treated horseshoe crabs experienced, immediately after they were bled transmitters were attached to them, and they were returned to their respective barrels. For the control animals, transmitters were attached at the same time, but they were returned to the flow-through tanks at JEL. The bled an-

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imals remained in their barrels overnight to replicate a second night at a bleeding facility (20.5 ± 1.1 °C). Then the barrels were placed back into a car for 4 h (21.9 ± 0.9 °C) to simulate transportation back to the dock, where they would be loaded on vessels and returned to their capture location. Finally, all 28 horseshoe crabs were returned to their collection site at Adams Point and released into the estuary.

Acoustic telemetry/tracking

An array of VR2W acoustic monitoring receivers ($n = 11$; 69 kHz; VEMCO) was set up throughout the estuary, ranging from Fox Point to the Great Bay Discovery Center (Fig. 1). The receivers were deployed ~0.5 km apart and were attached to a mooring line suspended ~5–10 m from the bottom, or placed in an empty lobster trap, depending on the depth of the listening station (some areas were only ~2 m deep at low tide). Based on previous range tests, each receiver was capable of detecting a horseshoe crab with a transmitter attached when it was within 200–500 m of the receiver. However, this range varied as a result of currents, turbidity, topography, weather events, and high winds. The transmitters were programmed to take depth (m) and triaxial (x, y, z) acceleration (m s^{-2}) readings at 5 Hz within a 25-s period. Then, every 70–140 s the acceleration data (root mean square of the three axes [m $s^{-2} = (x^2 + y^2 + z^2)^{1/2}$ averaged over T, time]) obtained during the most recent 25-s period (T), or the depth at that time, were transmitted (depth and acceleration transmissions would alternate). Based on specifications for these transmitters, the proportion of time for which acceleration was measured was only 12% of every 2–5 min. Each time a transmission was received, the receiver would record the date and time and either the acceleration or the depth of the animal.

Receivers were downloaded in VUE software 2.3.0 (VEMCO) every one to two weeks in the spring and summer and about once every month in the fall, and they were removed from the water in the winter after the date the transmitters were programmed to shut off. After each download, if the receiver had multiple detections of different animals, it would be kept in the same location. If the receiver did not contain a viable number of detections, we would move it to a more suitable location. HOBO temperature data loggers were attached to several of the receiver mooring lines to record water temperature every five minutes for the duration of the project. The temperature data loggers were placed near the release site, at JEL, and in the middle of Little Bay. Near the middle of Great Bay, temperature data were collected by a buoy that was deployed by the NOAA National Estuarine Research Reserve System (NERRS). This buoy was located on the outskirts of the deep channel, with the temperature logger ~1 m below the surface of the water.

A VR100 acoustic receiver and a VH165 omni-directional hydrophone (VEMCO) were also used to manually track horseshoe crabs. The hydrophone was plugged into the VR100 receiver and was slowly towed behind a research vessel to locate tagged horseshoe crabs. If a horseshoe crab was within range, the geographical position (GPS coordinates), depth, and/or acceleration were logged in the VR100. These data were downloaded after each trip in VUE software and were used to help determine the location of animals and the best positions for deploying receiver stations.

Data analyses. A previously determined threshold value of 0.1 m s^{-2} (Watson *et al.*, 2016) was used to classify an animal as either active or inactive based on accelerometer tag output. Data were lumped into 10-minute bins; and if an animal exceeded the threshold value during any of the minutes in that 10-minute period, the animal was considered to have been active during that 10-minute period. These values were entered into the program ActogramJ to create actograms that could be used to determine the types of rhythms expressed by individual horseshoe crabs (Schmid *et al.*, 2011). Periodograms, using the Lomb-Scargle method, were used to determine when animals expressed significant circatidal (~12.4-h) or circadian (~24-h) rhythms (peaks exceeding $\alpha = 0.001$; tidal: 10–14-h range; daily: 22–26-h range; arrhythmic: no significant peaks).

For most analyses, we used data only from animals that were detected for more than seven days in a row in a given month. Three-way ANOVAs were used to test for effects of treatment group (bled and control), years (2016 and 2017), and sex (males and females) on days at large and also on ranges of movements in the estuary. Days at large were calculated as the first day in a season an animal was detected until the last day an animal was detected. Ranges were measured as the distance from the animal's farthest up-estuary position to its farthest down-estuary position. Two-way ANOVAs were used to test for effects of treatment groups and sex on mating and also on depth changes. A MANOVA was used to look at the impacts of sex, treatment groups, and months on percentage of time active and depth in different animals. In all cases, the time active, movements, and rhythms of control animals were compared to the experimental animals. Tukey's honest significant difference *post hoc* analyses (with a level of significant difference set at $P < 0.05$) were used to examine differences between means of treatment groups, monthly depths, rhythms expressed at different depths, and sexes. Correlational and single linear regression analyses were used to determine relationships between temperature and years, as well as between activity and depth across months. Unpaired Student's t tests were used to compare depth or activity between treatment groups.

To determine whether horseshoe crabs were approaching spawning beaches, changes in animals' depths and tide heights were examined together, along with their activity. Water depth and tide height data were obtained from the Squamscott River Monitoring Station (data provided by the NOAA Tide Predictions website, https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=8422687) and the Great Bay

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Buoy (data provided through the Northeastern Regional Association of Coastal Ocean Observing Systems, Portsmouth, NH, and University of New Hampshire Center for Coastal Ocean Observation and Analysis, Durham, NH). Horseshoe crabs were considered "spawning" if they showed high activity levels (>0.1 m s^{-2}; Watson *et al.*, 2016) around the times of high tides, commensurate with a movement to a shallower location, during the peak of the spawning period in 2016. Only data from the first two weeks after release were used for these analyses, for two reasons: (1) this time period represented the peak of the spawning season in 2016 in the GBE, and (2) most of the animals were still within the VR2W array and near the spawning beaches where we collected them, which enabled us to obtain the maximum possible amount of data from the most animals before they dispersed. For each animal we determined how many high tides occurred while we were collecting continuous data from them. Then, to determine the spawning percentage, we divided the number of apparent spawning events (identified as described above) by the number of available high tides they experienced.

Results

Days at large and days detected

A total of 28 horseshoe crabs were successfully tracked in the GBE, from May 15 to December 6, 2016 (205 days); and data were also obtained from 23 of these between April 14 and October 4, 2017 (191 days). In 2016, animals were at large for an average of 158 ± 59 days (max = 205, min = 7) and were detected for 84.3 ± 50 days (max = 180, min = 8). In 2017, the 23 animals were at large for 91 ± 56 days (max = 172, min = 1) and were detected for 32.4 ± 41 days (max = 171, min = 0).

Potential mating events

Based on data from New Hampshire *Limulus* spawning surveys, which are conducted each year, including during this study (Cheng *et al.*, 2016), the mating season for 2016 started on May 9, when temperatures reached 11.2 °C; it peaked around May 21–26; and it ended around June 10. The mating season for 2017 started on May 16, when temperatures reached 11.3 °C; it peaked around June 10–16; and it ended around June 20. We used these data to focus our analyses of potential impacts of the bleeding process on mating behavior on the peak spawning period that occurred right after animals were released.

The criteria outlined in Materials and Methods were used to determine whether horseshoe crabs approached spawning beaches to possibly mate (Fig. 2). Out of all the times animals were detected during each high tide within the first week after they were released, females appeared to mate less than males, bled animals less than controls, and bled females much less than control females (Fig. 3; Table A1). More precisely, control females appeared to spawn 4.8 ± 2.5 times during the first week after they were released, while bled females spawned only 2.0 ± 0.7 times. Out of the animals that were detected for at least two weeks, there was no difference in apparent mating events between the first and second weeks post-release (Student's paired *t* test, $P = 0.16$; data not shown). These analyses were not performed in 2017 because there were not enough animals present near the spawning areas that were being monitored with VR2W receivers, and they did not appear to approach beaches to mate for a long enough time period to provide sufficient data for a rigorous analysis.

Biological rhythms

2016. Horseshoe crabs from which we obtained sufficient data for biological rhythm analyses (*i.e.*, at least seven days of continuous data) exhibited both tidal and daily rhythms. In June, all animals expressed tidal rhythms ($n = 12$; $\tau = 12.4$ h; Table 1; Fig. 4). This corresponds to the mating season in 2016 in GBE. In the following months they exhibited a combination of arrhythmic, daily, and tidal rhythms (Table 1; Figs. A1, A2). While there were more control animals detected, the majority of both treatment groups expressed clear daily or tidal rhythms from June to October 2016. When we added up all of the months during which a given animal expressed a clear rhythm, control animals were rhythmic during 30 of 32 months, while bled animals expressed clear biological rhythms in 15 of 16 months (Table 1). All animals that expressed daily rhythms ($\tau = 24$ h; Fig. A1) were more active during the day than at night, except for Animal 75, which was more active during the night in July and September. There was no significant difference between the depths where animals resided in months that they displayed daily rhythms (4.4 ± 1.4 m) *versus* tidal rhythms (3.3 ± 1.3 m; unpaired Student's *t* test, $P = 0.5$). This was also true for the relationship between depths and rhythms for animals that switched from one kind of rhythm to another (Fig. A2). There was also no clear relationship between sexes and the expression of different rhythms (Table 1). Finally, four animals switched from a tidal rhythm to a daily rhythm in July, directly after the mating season (Table 1; Fig. A2).

2017. In 2017, these same animals continued to express the same variety of rhythms (Table 1). Since different animals were detected at different times in 2017, there was a lower sample size and a greater distribution of rhythms, so we have chosen to discuss the two years separately. In April, before the start of the mating season, horseshoe crabs exhibited tidal rhythms or were arrhythmic. Interestingly, all of the bled animals ($n = 4$) were arrhythmic. After April, there was no clear difference between the types of rhythms exhibited by both groups. In June, only 1 animal expressed a tidal rhythm in 2017, while 13 did so in 2016; but there were also fewer animals detected overall. As in 2016, all animals that displayed daily rhythms were more active during the day than at night. In contrast to 2016, there was a significant relationship between the depths

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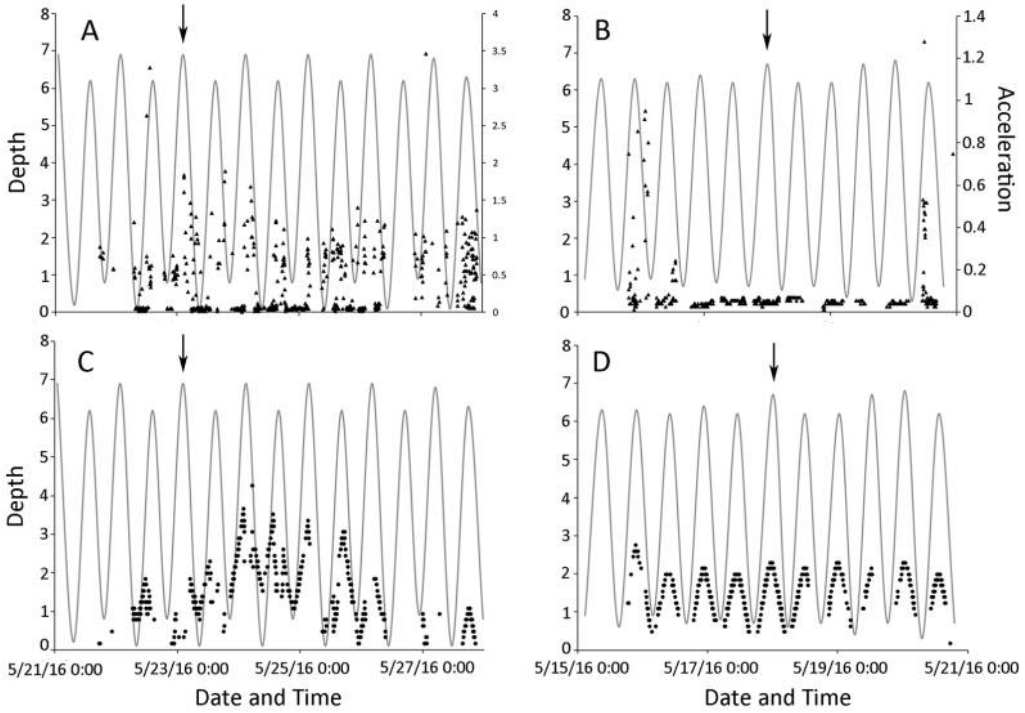


Figure 2. Potential mating events recorded from one control female (A, C) and one bled female (B, D) horseshoe crab. The gray lines in all graphs indicate the natural tides (in feet, so they can be distinguished from the depth of animals, which is shown in meters). The top graphs show the accelerometer output (m s^{-2}) of the tags on a control female (A) and a bled female (B). The filled circles in the bottom two graphs show the depth (in meters) of both females. Note that the bled female did not move much, so her depth followed the tides very closely. In contrast, the control female was very active, especially during high tides, and sometimes she moved into shallow water during a high tide (at times indicated by the arrows in A and C). We considered these to be potential mating events.

occupied by animals and the types of rhythms they expressed. Animals that were arrhythmic resided in deeper water (9.8 ± 4.5 m) than animals that expressed tidal rhythms (4.7 ± 2.4 m) or daily rhythms (4.6 ± 1.1 m; ANOVA, $F_{2,21} = 8.22$, $P = 0.002$).

Ranges of animal movements

All of the horseshoe crabs appeared to remain within the GBE for the duration of the study. The farthest an animal moved from the release site toward the coast was 3.2 km, and the farthest an animal traveled up-estuary was 3.4 km. In 2016, the mean annual range of movement (distance from the animal's farthest up-estuary position to its farthest down-estuary position) was 3.3 ± 1.7 km, and in 2017, it was 3.2 ± 1.3 km. There was no difference in range for years, between treatments, or between sexes (Table A2).

In 2017, 5 out of the 23 detected animals returned to their release site (Fig. A3). Four of these animals returned during the mating season in May–June. All four were males, three were controls, and one was a bled animal. The fifth animal was a control female that returned to the release site in late July. Because this is generally two to three weeks after horseshoe crabs stop spawning in the GBE (Schaller *et al.*, 2010; Cheng *et al.*, 2016; Watson *et al.*, 2016), it probably was not spawning at that time.

Overall seasonal changes in behavior

The water temperature in the GBE ranged from 9.5 to 25.4 °C during the time when we were tracking animals, and there was no difference in the mean water temperature between the 2 years of the study (2016: 18.9 ± 3.6 °C; 2017: 18.12 ± 3.2 °C; $P < 0.0001$). We also ran a regression comparing the daily temperatures in each year, and they were highly correlated ($r = 0.85$, $P < 0.0001$).

The majority (21 of 23) of the animals that were detected in 2017 were first detected near the location where they were last detected in 2016. The 2 animals that were not detected at their exact location from the previous year were still in Little Bay but ±2.3 km up- or down-estuary from their last location. Therefore, although transmitters were turned off during the winter season, all of the animals appeared to have remained in the same location throughout the winter months.

Seasonal changes in depth and activity. Only animals that were detected and active for at least seven days in a given month were used for depth and activity analyses (2016: $n = 21$; 2017: $n = 11$). In 2016, there was a significant correlation

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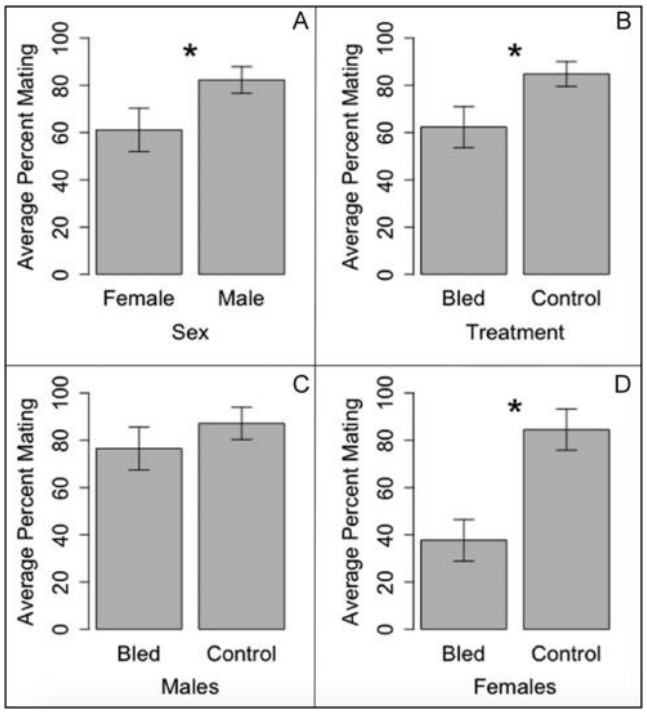


Figure 3. Average percent (±SEM) of times that horseshoe crabs appeared to be mating as a function of the number of high tides they experienced during the first week after they were released. (A) Females ($n = 10$) appeared to mate less than males ($n = 13$). (B) Bled animals ($n = 12$) appeared to mate less than control animals ($n = 11$). (C) There was no difference between control males ($n = 6$) and bled males ($n = 7$). (D) Bled females ($n = 5$) appeared to mate less than control females ($n = 5$). Asterisks indicate statistically significant differences ($P < 0.05$).

between activity and depth ($r^2 = -0.35$, $P = 0.01$), with animals being more active when they were in shallower water (Fig. A4). In addition, animals tended to be more active from May to August when water temperatures were warmer (≥~18 °C). There was no difference between bled and control animals in terms of the percentage of time when they were active (unpaired Student's t test, $P = 0.4$). As water temperatures started to decrease in the fall, animals moved deeper and exhibited a lower amount of activity, and bled animals spent significantly more time in deeper water in 2016 than control animals (Fig. 5; Table A3). Finally, 15 of the 21 animals that migrated from Great Bay to Little Bay (toward the coast) moved in late July to early August when temperatures peaked at 22 °C. The following year, 14 of 15 of those animals moved back into Great Bay when temperatures reached 11.2 °C in May.

In 2017, only four animals (three males and one female) were detected continuously, and were active, for at least seven days in a month. Based on data from only these four animals, there was a significant difference between month and depth (MANOVA, $F_{6, 19} = 3.32, P = 0.021$) but no significant difference between activity and month (MANOVA, $F_6 = 1.410$, $P = 0.262$).

Summary of seasonal movements. Most of the animals in this study followed the same seasonal trends of activity and depth preferences that were reported in two previous studies in the GBE (Fig. 6; Schaller *et al.*, 2010; Watson *et al.*, 2016). Animals overwintered in deep water and remained there until water temperatures started to exceed ~11 °C in the spring. At this time, they moved up into the estuary, where it tends to be shallower, and they had a higher level of activity during warmer months of the year. Then in the fall they returned to deeper water as temperatures began to drop. It should also be noted that when water temperatures exceeded 20 °C, 8 of the animals in 2017 moved out of Great Bay to Little Bay, where the water is a bit cooler, which is exactly what these same animals did at the same time in 2016 (late July to early August).

Between 2016 and 2017, there were no major differences in the seasonal migration trends, or annual ranges, of bled *versus* control animals (Fig. 6). However, there were some distinct changes in the seasonal movements of some of the bled animals from one year to the next. One noticeable trend was that in May and June of 2017, the bled animals did not approach shallower areas in Great Bay, preferring to remain in deeper channels. Out of all of the animals that were detected in 2017 (regardless of whether they were also detected at the same time in 2016), bled animals remained in deeper waters than controls (unpaired Student's t test, $P < 0.001$).

Discussion

While some of the impacts of the biomedical bleeding process have been studied in the laboratory and in the field, this seems to be one of the first comprehensive studies designed to determine the behavioral impacts that the bleeding process has on the horseshoe crabs that are released back into their natural environment. The two most obvious impacts we found were that (1) bled females appeared to approach beaches to mate less frequently than control females, and (2) bled animals remained in deeper water than control animals during certain times of the year. However, there was no difference in the annual ranges of bled *versus* control animals or in their overall distribution in the GBE across months or years.

Mating

Since it is well known that horseshoe crabs mate at high tide at spawning beaches during the spring and early summer (Rudloe, 1980; Cohen and Brockmann, 1983; Barlow *et al.*, 1986; Cheng *et al.*, 2016), it was possible to use a combination of depth, tide, and accelerometer data to determine possible mating events of animals fitted with appropriate acoustic transmitters. We found that control animals probably mated, or at least moved inshore toward mating beaches during the high tides, more often than bled animals during the first tracking season, especially when comparing bled *versus* control females. These data suggest that the bleeding process might have an immediate impact on the reproductive output of fe-

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Table 1

Rhythms expressed by individual horseshoe crabs for each month in 2016 and 2017

			2016					2017					
Animal no.	Treatment	Sex	June	July	August	September	October	April	May	June	July	August	September
69	B	F	T	T									
70	B	F	T	T		T		A	A	A		A	
71	B	F	T	A									
39	B	M	T										
73	B	M			T				T				
74	B	M			T			A	T			D	
75	B	M		T/D	D	D		A					D
85	B	M			D			A	A				D
87	B	M	T	T									
37	C	F	T	T/D	T	T	A						
38	C	F	T	T									
76	C	F	T	D	D								
77	C	F		T	T				D			D	
80	C	F	T	T/D	T	T			D		D		
37	C	F	T	T/D	T	T	A	T	D	T	D		
38	C	F	T	T	D								
68	C	M	T	T	T		D						
36	C	M	T	T	T		D						

A, arrhythmic; B, bled; C, control; D, daily rhythm; T, tidal rhythm; T/D, both tidal and daily rhythms. Empty cells indicate that data were not sufficient to identify a type of rhythm.

male horseshoe crabs for that season. These data are also consistent with the decreases in activity in bled animals that were documented by Anderson *et al.* (2013) in previous laboratory experiments. Since female horseshoe crabs are preferentially selected for in the biomedical bleeding process because of their size (James-Pirri *et al.*, 2012), and their mortalities are consistently greater than males (Leschen and Correia, 2010; James-Pirri, 2012; Krisfalusi-Gannon *et al.*, 2018), both the lethal and sublethal impacts of the bleeding process can alter the effective sex ratio and reproductive output of the population. For example, in several areas where horseshoe crabs are harvested, such as Pleasant Bay, Massachusetts, there has already been a 20% decrease in female appearances at spawning beaches (Carmichael *et al.*, 2003; Malkoski, 2010); and egg abundances have also significantly decreased at spawning sites (James-Pirri, 2012). Although Massachusetts regulations do not permit the harvesting of horseshoe crabs during the 5 days including and surrounding the new and full moons during the mating season, this does not always coincide with the peak of the spawning season; and many horseshoe crabs mate during other high tides during the ~1.5-month-long spawning season (Smith *et al.*, 2010; Cheng *et al.*, 2016). Therefore, it might be prudent to revisit harvest regulations and consider not harvesting horseshoe crabs at all during the majority of the spawning period.

Males are more frequently detected at mating beaches than females (Loveland and Botton, 1992). Furthermore, females usually only spawn several times within one week and do not return until the next year, whereas males return to these beaches more often (Rudloe, 1980; Brockmann and Penn, 1992; Leschen *et al.*, 2006). This trend was also evident in this study, further supporting the hypothesis that the skewed sex ratios observed near most mating locations are due to behavioral differences between males and females and are not indicative of the actual sex ratios of the local populations.

In this study, we restricted our analyses of mating behavior impacts to just 2 weeks during the peak of the mating season, allowing for ~14–15 potential mating events per week. Control animals appeared to mate, on average, three to four times a week, whereas bled animals mated one to two times per week. For control animals, this meant that they were likely to be mating during 22%–29% of the potential high tides, while bled animals appeared to be mating during only 7%–14% of them. Although these numbers are consistent with the results reported by Watson and Chabot (2010) and Brousseau *et al.* (2004), they are slightly lower. This difference could be due to two main factors. First, because our animals were released midway into the spawning season and because we examined only two weeks of data, some of our subjects might have already mated, or attempted to mate, several times before they were captured. Second, environmental factors could have affected spawning. During our spawning surveys, in both years, we noted that there was (1) heavy rain, (2) increased detritus on beaches on days immediately following large storms, and (3) overcast conditions. All of these factors appear to be correlated with fewer mating animals. A similar pattern was observed during spawn-

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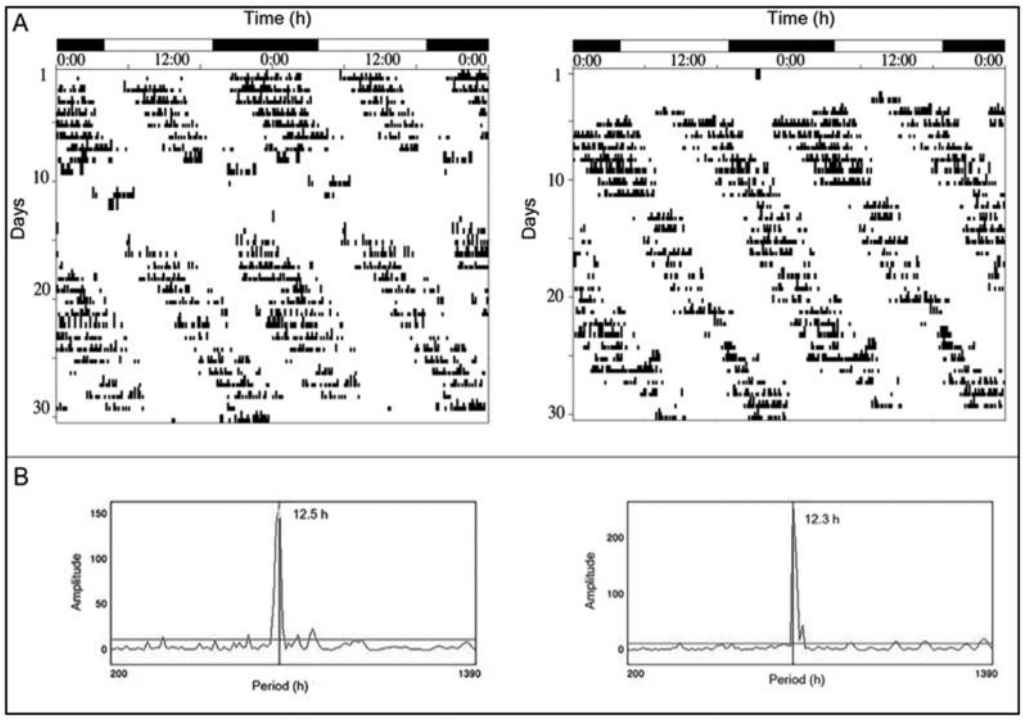


Figure 4. Representative tidal rhythms expressed by two horseshoe crabs in June. (A) Actograms showing the activity of a control female (left) and a bled female (right). The lack of activity by the control female around days 11–14 may represent a span of time when the animal was not within the detection range of a receiver. Each small black tick mark represents the amount of activity per 10 min. The *x*-axis is double plotted to make rhythms appear more evident, showing a span of 48 h for each line. The white and black horizontal bars at the top in (A) represent the light and dark periods of the day, respectively. The *y*-axis represents the 30 days in June 2016. (B) Periodograms displaying significant periods of activity ($P < 0.05$) for each animal for the amount of time shown in the actograms. The control female on the left and the bled female on the right had similarly strong tidal rhythms ($\tau = 12.5$ h *vs.* $\tau = 12.3$ h).

ing surveys in the GBE in 2012 and 2013, when periods of heavy rain were correlated with periods of decreased spawning activity (Cheng *et al.*, 2016).

Behavioral rhythms

Horseshoe crabs possess endogenous clocks (Chabot *et al.*, 2007) that allow them to anticipate changes in environmental factors, specifically changes in tides, so they can synchronize their spawning and foraging activities to particular phases of the tides (Cohen and Brockmann, 1983; Barlow *et al.*, 1986; Watson and Chabot, 2010). Any disruptions to the rhythms controlled by these clocks could have negative implications for reproduction and survival. In 2016, all animals that expressed activity in June had tidal rhythms. This is likely because this was the spawning season, when they approach mating beaches at high tide (Rudloe, 1980; Shuster and Botton, 1985; Barlow *et al.*, 1986). During the following summer, animals expressed both tidal and daily rhythms or became arrhythmic; and then in October no animals expressed tidal rhythms. This same seasonal transition was reported in previous studies, and it is likely due to the fact that as winter approaches, crabs move into deeper waters and prepare for overwintering (Chabot and Watson, 2010; Watson *et al.*, 2016).

In 2016, animals that had daily rhythms were more active during the day than at night. It has been previously argued that horseshoe crabs spawn more and increase their activity at night (Cavanaugh, 1975; Rudloe, 1980, 1981; Barlow, 1983; Barlow *et al.*, 1986; Finn *et al.*, 1990; Swan *et al.*, 1991, 1993; Smith *et al.*, 2010). In the GBE, this hypothesis has not been supported by previous telemetry studies or spawning surveys; in contrast, horseshoe crabs have actually been shown to be significantly more active during the day (Watson *et al.*, 2009; Watson and Chabot, 2010). The data from this study are consistent with this pattern of activity.

In 2017, there appeared to be some impact of the bleeding process on the expression of biological rhythms, as indicated by the fact that more bled animals were arrhythmic (four of nine animals) in 2017 than control animals (zero of three animals). For example, Animal 70, a bled female, remained arrhythmic throughout all of the months that it was active, including during the spawning season. However, the animals that were arrhythmic were also deeper and mostly manifested these behaviors in April, before the start of the spawning sea-

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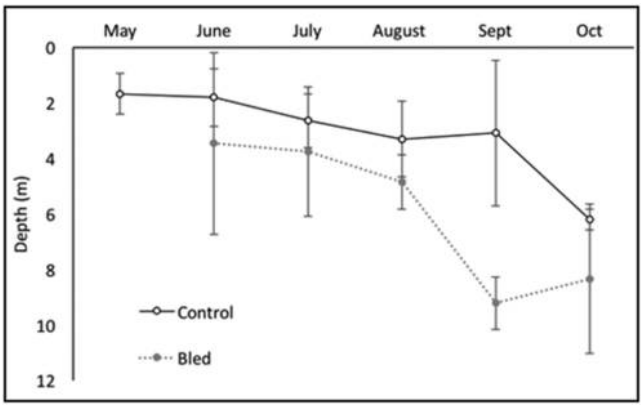


Figure 5. Mean monthly depth (±SEM) of horseshoe crabs from May to October 2016. Bled horseshoe crabs tended to remain deeper than control horseshoe crabs. Data are not shown for bled horseshoe crabs in May because there were insufficient data from the bled animals. Sample sizes for activity and depth for each month were as follows (Control, Bled): May (4, 0); June (6, 3); July (6, 4); August (5, 4); September (2, 2); October (2, 3); November (2, 1).

son, which is not too unusual. They usually do not begin to express clear rhythms until temperatures increase in late spring (10–11 °C; Schaller *et al.*, 2010). Nevertheless, two other bled animals were also arrhythmic in May and June during the spawning season, and this could be a result of having been bled, especially considering that all of the horseshoe crabs expressed tidal rhythms in June in 2016 but only two of five bled animals in May and June of 2017. However, it should also be noted that only one of three control animals expressed a tidal rhythm in 2017, so other factors could have played a role. Therefore, it is possible that the bleeding process could have delayed and extended impacts on the expression of rhythms and depth preferences, and thus on both foraging and mating behaviors. However, we have no explanation for how the bleeding process could lead to behavioral impacts that manifest themselves about a year after the procedure. Clearly, more studies are necessary to confirm that bled animals tend to reside in deeper water and approach mating beaches less often than control animals many months after the procedure.

Movements and migrations

The 28 animals that were tracked in 2016 appeared to remain within the GBE, along with the 23 that were detected in 2017. In fact, 21 of the 23 animals detected in 2017 were first detected at the same location where they were last detected in 2016. This is consistent with previous findings in the GBE (Schaller *et al.*, 2010), as well as in other embayments, such as Pleasant Bay, Massachusetts (James-Pirri, 2010). Horseshoe crabs are thought to be philopatric to the embayments where they spawn, and in New England specifically, horseshoe crab populations appear to be more localized and do not seem to migrate offshore (Baptist *et al.*, 1957; Botton and Ropes, 1987; James-Pirri *et al.*, 2005; Moore and Perrin, 2007). Therefore, if horseshoe crabs are harvested from a particular area, it is unlikely that they would be replenished from adults or larvae from a different area. In addition, if they are removed from one area, bled, and returned to a different area, they might not have the ability to adjust their migration and spawning behaviors to the new region.

There were no clear differences in the annual range of movements or seasonal migrations between control and bled animals. These annual ranges were similar to those found in Cape Cod, Massachusetts, and Maine embayments (Kurz and James-Pirri, 2002; James-Pirri *et al.*, 2005) and followed the same patterns that have been described in other New England estuaries and in the GBE. In the spring, when the water temperature reached 10–11 °C (Schaller *et al.*, 2010), the horseshoe crabs moved up-estuary to shallow areas near mating beaches. In 2017, this was clearly shown in our data because the transmitters turned on before the mating season. There was a clear trend of animals moving from deeper waters where they stayed in April to shallower waters in May, when the temperature threshold was reached. Then, after mating, when the estuary was the warmest in July and August, animals moved down-estuary; and they eventually overwintered at the farthest down-estuary portion of their annual range. As previously mentioned, in 2017, when our transmitters re-activated, 21 of the 23 animals were in the same location where they were last detected in December 2016, when the transmitters were de-activated. These seasonal movements are thought to be driven by temperature preferences, with animals seeking warmer water during the spawning season, then moving toward the coast when the water temperature rises above ~20 °C, and finally seeking deep water in the fall, which tends to be warmer in the winter (Schaller *et al.*, 2010). These thermal preferences could be an important factor driving mating behaviors because temperature plays a large role in egg development (French, 1979). Moreover, recent studies have demonstrated that horseshoe crabs can detect changes in water temperature and that, when given a choice, they prefer slightly warmer water (Cheng, 2015).

Although there was no significant difference in the annual range of movements between bled and control animals, or in the overall seasonal migration trends, there were some distinct changes in the seasonal movements of some animals from one year to the next. Most of the control animals followed similar patterns, but there were several bled animals that had very different migration routes between 2016 and 2017. One noticeable trend was that in May and June, the bled animals did not approach shallower areas in Great Bay but remained in the deeper channels. This trend is consistent with data showing that bled animals remained deeper throughout the year in 2016 and that bled females mated less than control females. In other words, some of the immediate impacts of bleeding that we observed in 2016 continued in 2017. There are two potential reasons why these bled animals remained in deeper water. First, in the laboratory, disrupted orientation and a random di-

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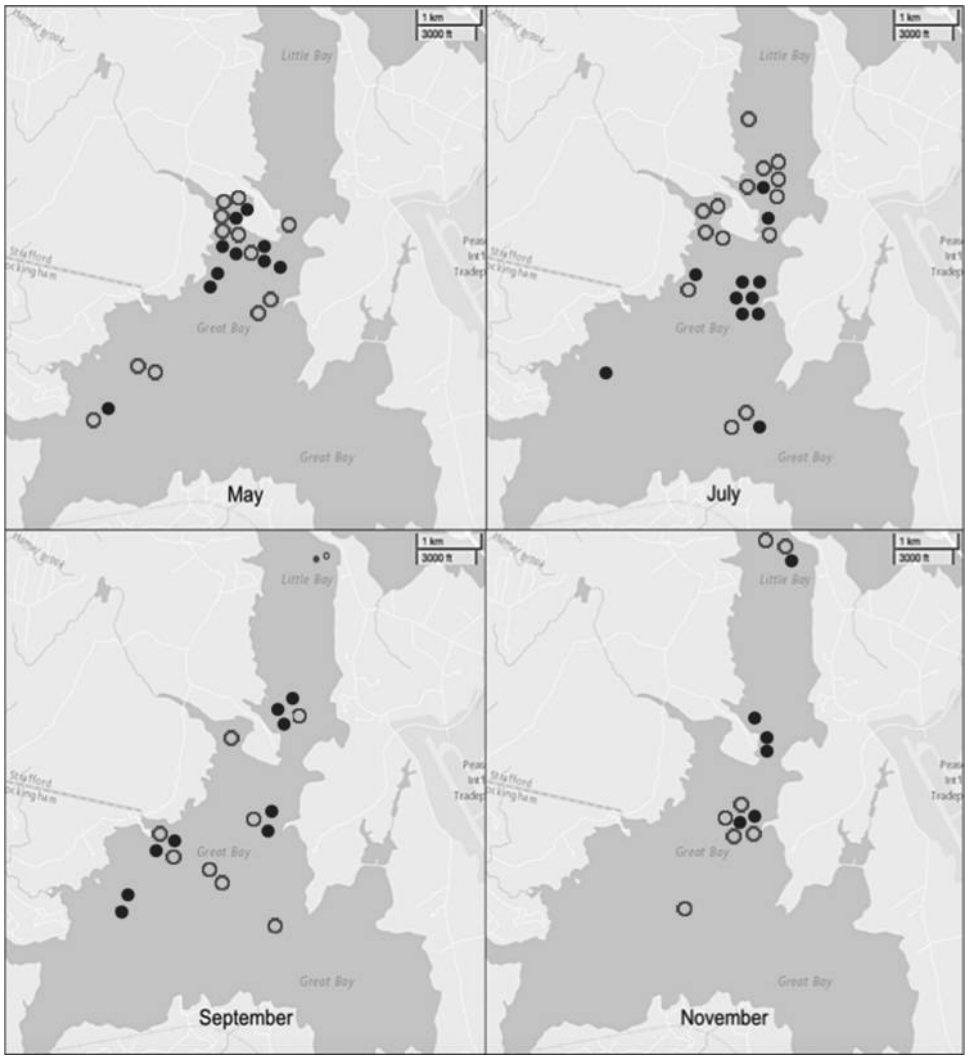


Figure 6. Maps of the location of horseshoe crabs, by season, in 2016. Filled dots represent bled animals, and open dots represent control animals. It should be noted that these locations are based on detections by acoustic monitoring receivers and, thus, do not necessarily represent the exact locations of each animal.

rection of movements have been observed in bled horseshoe crabs (Anderson *et al.*, 2013). Moreover, in one of the previous field studies comparing the impact of biomedical bleeding on movement patterns in Cape Cod, it was found that the bled group tended to have more random movements than control animals (Kurz and James-Pirri, 2002). This disorientation could prevent horseshoe crabs from locating spawning beaches and could also explain why the bled animals remained deeper and farther away from spawning beaches. Second, bled animals may not have been as motivated to spawn, and, therefore, they did not move toward spawning beaches as often as controls. This lack of motivation could be due to the fact that bleeding influenced their energy utilization and shifted it from reproduction to stress remediation. For example, Hu *et al.* (2011) showed that starvation of two Asian horseshoe crab species led to a decrease in their respiration rates and ammonia excretion rates, which was correlated with a decrease in scope for growth.

Interestingly, 5 out of the 23 animals in 2017 returned to their original release site where they had been captured while spawning. Four were control animals, and one had been bled. In a telemetry study completed in Delaware Bay, 77% of animals did not return to the same beach to spawn (Smith *et al.*, 2010), so we did not necessarily expect all of the animals to show up at their original spawning location in 2017. Therefore, while the 4 : 1 ratio of controls to bled animals is interesting, it is possible that this relates not to an inability of bled animals to find the same spawning beaches from year to year but to the fact that most animals do not return to the same spawning beach each year.

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Overall impacts

Overall, there were some immediate impacts of the bleeding procedure on mating behaviors and the expression of biological rhythms, and there also appeared to be a tendency for bled animals to reside in deeper water during both the first and second years of the study. If bled animals, especially females, have alterations in their biological rhythms and mating behaviors, it is likely to further alter the sex ratio on spawning beaches, reduce reproductive output, lower population levels, and decrease the fitness and survival of this keystone species. Further studies should investigate the immediate effects of the bleeding process on horseshoe crabs during the mating season to obtain a more precise and accurate assessment of their behavior in the vicinity of mating beaches. Also, the orientation of bled animals in their natural habitat should be examined because one laboratory study and one field study indicate that some bled horseshoe crabs do not orient in the same manner as normal adult horseshoe crabs. Taken together with the results of many previous investigations, it appears as if the biomedical bleeding process might have some behavioral impacts that could impact the sustainability of harvested *Limulus* populations; and, thus, there is a need for further investigations into possible improvements that might reduce these effects.

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Appendix

Table A1

Two-way ANOVA results from likely mating events for horseshoe crabs tracked in 2016 comparing different sexes (males and females) and treatments (bled and controls)

	Likely mating events			
Source	df	MS	*F*	*P*
Sex	1	2568.405	6.019	**0.024**
Treatment	1	3800.770	8.906	**0.008**
Sex × treatment	1	2449.484	5.740	**0.027**
Error	19	426.746		
Total	23			

Significant differences are shown in bold ($P < 0.05$). MS, mean square.

Table A2

Three-way ANOVA results comparing the ranges of horseshoe crabs tracked in 2016 and 2017 comparing different years (2016 and 2017), sexes (males and females), and treatments (bled and controls)

	Range			
Source	df	MS	*F*	*P*
Sex	1	1.555	0.613	0.438
Treatment	1	0.475	0.187	0.667
Year	1	0.010	0.004	0.950
Sex × treatment	1	2.842	1.120	0.296
Sex × year	1	0.153	0.060	0.807
Treatment × sex	1	0.017	0.007	0.936
Year × sex × treatment	1	4.583	1.807	0.186
Error	40	2.537		
Total	48			

MS, mean square.

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Table A3

MANOVA results from depth and activity data for horseshoe crabs tracked in 2016 comparing different sexes (males and females), treatments (bled and controls), and months (May–November)

		Depth and activity			
Source		df	MS	*F*	*P*
Month	Depth	6	36.683	3.947	**0.008**
	Activity	6	309.357	0.895	0.515
Sex	Depth	1	30.426	3.274	0.084
	Activity	1	0.047	0.000	0.991
Treatment	Depth	1	63.789	6.863	**0.016**
	Activity	1	184.634	0.534	0.472
Month × sex	Depth	5	2.676	0.288	0.915
	Activity	5	38.196	0.111	0.989
Month × treatment	Depth	6	7.608	0.819	0.567
	Activity	6	86.332	0.250	0.954
Sex × treatment	Depth	1	1.157	0.124	0.728
	Activity	1	70.64	0.204	0.656
Month × sex × treatment	Depth	1	0.141	0.015	0.901
	Activity	1	13.061	0.038	0.848
Error	Depth	22	9.295		
	Activity	22	345.489		
Total	Depth	44			
	Activity	44			

Significant differences are shown in bold. ($P < 0.05$). MS, mean square.

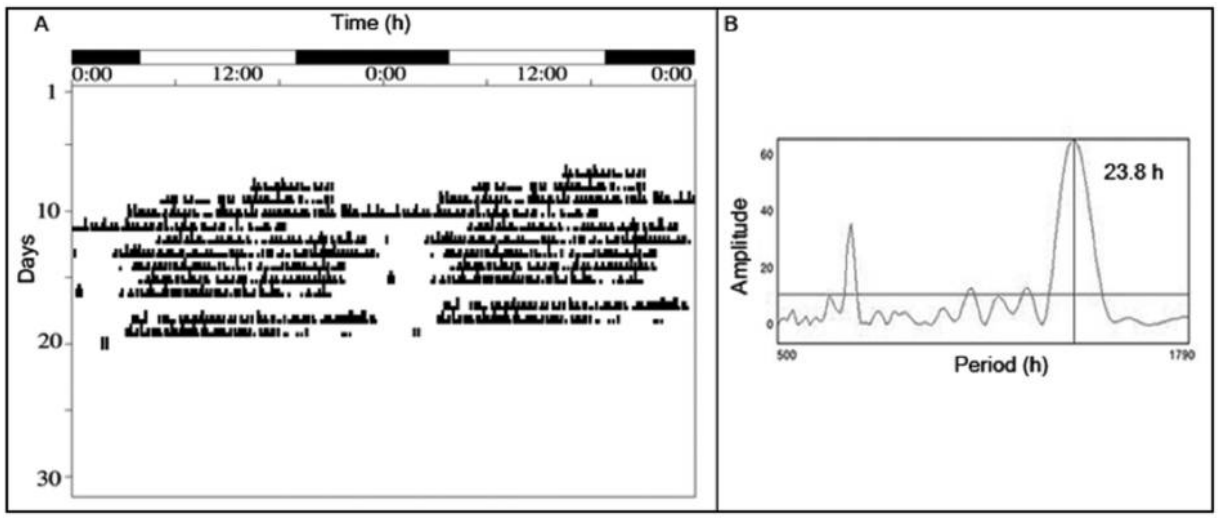


Figure A1. Representative example of the expression of a daily rhythm in a horseshoe crab. (A) Actogram of a control female that expressed a daily rhythm and was more active during the day. (B) Periodogram showing that this animal had a significant rhythm ($P < 0.05$) with $\tau = 23.8$ h. Each small black tick mark represents the amount of activity per 10 min. The *x*-axis is double plotted to make rhythms appear more evident, showing a span of 48 h for each line. The white and black horizontal bars at the top in (A) represent the light and dark periods of the day, respectively. The *y*-axis represents the 30 days in July 2016. The horizontal line above the *x*-axis in (B) indicates $P = 0.001$.

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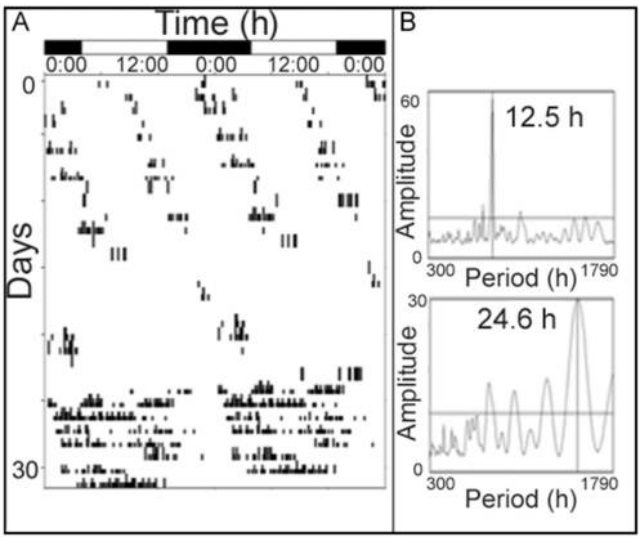


Figure A2. An example of a horseshoe crab that switched from a tidal rhythm to a daily rhythm. (A) This animal expressed a tidal rhythm during the first 25 days and then a daily rhythm during the last 8 days. (B) Periodograms showing that this animal had a significant rhythm ($P < 0.05$) of 12.5 h during the first 25 d and 24.6 h during the last 8 d. Each small black tick mark represents the amount of activity per 10 min. The *x*-axis is double plotted to make rhythms appear more evident, showing a span of 48 h for each line. The white and black horizontal bars at the top in (A) represent the light and dark periods of the day, respectively. The horizontal line above the *x*-axis in (B) indicates $P = 0.001$.

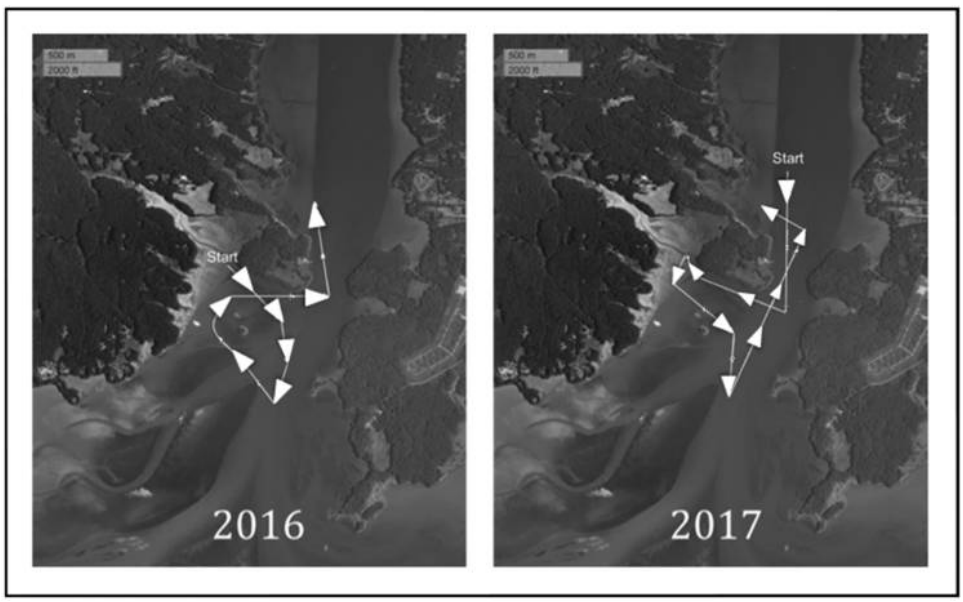


Figure A3. An example of a control horseshoe crab that returned to the mating beach where it was initially captured and released (indicated by "Start" on the left in 2016). Arrowheads indicate the direction of the path traveled by the individual in each year.

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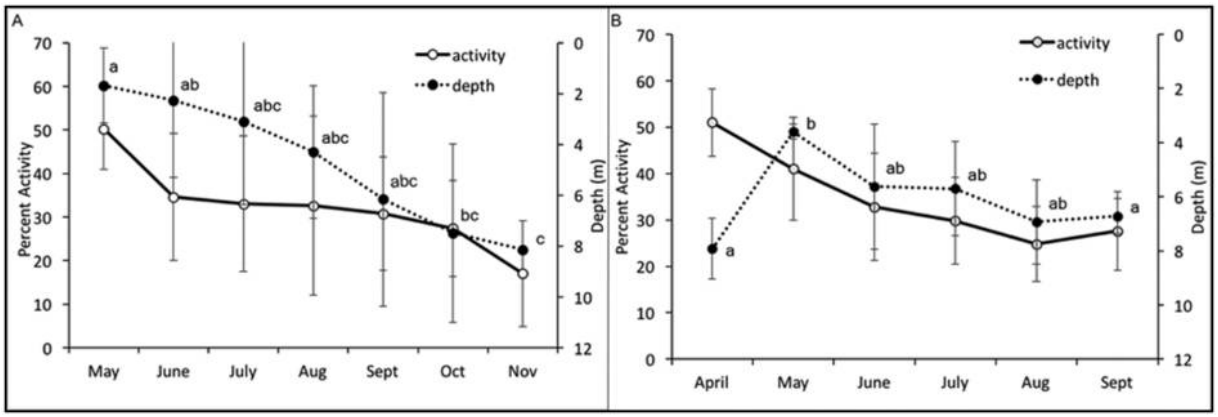


Figure A4. Mean (±SEM) monthly horseshoe crab (both bled and control) activity and depth for 2016 (A) and 2017 (B). Activity was calculated as the amount of time per day that animals were moving, based on accelerometer data. Data for these analyses were based on individuals that were detected for at least one week for each month. Sample sizes for activity and depth for each month were (2016, 2017) as follows: April (0, 5); May (4, 9); June (10, 2); July (10, 3); August (11, 4); September (4, 3); October (5, 0); November (3, 0). Different lowercase letters associated with the means represent significant differences for monthly depths (ANOVA, Tukey's honest significant difference *post hoc*, $P < 0.05$).

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Exhibit F

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OXFORD

Accelerating declines of North America's shorebirds signal the need for urgent conservation action

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ABSTRACT

Shorebirds are declining to a greater extent than many other avian taxa around the world. In North America, shorebirds, along with aerial insectivores and grassland birds, have some of the highest proportions of declining species of any group. Here, we apply a new hierarchical Bayesian model to analyze shorebird migration monitoring data from across North America, from 1980 to 2019, and present the most recent available estimates of trends for 28 species. Point estimates for survey-wide trends in abundance were negative for 26 of 28 species (93%). Despite challenges with low precision associated with migration count data, trends for 19 species had 95% credible intervals that were entirely negative. More than half of the species were estimated to have lost >50% of their abundance. Furthermore, estimated rates of decline have accelerated during the last three generations for most species. Point estimates of trend were more negative for 18 species (64%) during the most recent three-generation period in comparison to the previous three-generation period. Many species now exceed international criteria for threatened species listing. The analytic approach used here allows us to model regional variation in trends, although survey coverage and strength of inference were greatest in the eastern portions of North America (east of 100°W). We found the greatest declines at staging sites along the Atlantic Coast from North Carolina to Nova Scotia, and lesser declines along the Gulf Coast and in the midcontinental United States. The declines in shorebird populations reported here are worrisome and signal the urgent need for conservation action. In addition, it would be beneficial to validate these results through the collection and analysis of complementary data, and to initiate demographic studies throughout the annual cycle to determine where and when declines are most likely to originate. This improved information will allow for the development of more targeted efforts to reverse declines through conservation action.

Keywords: citizen science, migration, North America, population decline, shorebirds, trend analysis, wildlife surveys

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LAY SUMMARY

- Surveys of North American shorebirds during fall migration, carried out largely by volunteers, are used to monitor trends in the abundance of their populations.
- Between 1980 and 2019, 26 of the 28 shorebird species analyzed were found to be declining with more than half of the species losing more than half of their abundance.
- Declines were greatest along the Atlantic coast from Nova Scotia to North Carolina, and less severe along the Gulf coast and in the Midcontinent.
- Declines are worsening in recent years. These large and accelerating declines mean that many species now exceed international criteria for threatened species listing.
- Urgent conservation action is needed to slow and eventually reverse declines. Targeted research, and in particular studies of survival throughout the year, could help to pinpoint where shorebirds are most strongly impacted, so that conservation attention can be focused where it is most needed.

La disminución acelerada de las aves playeras de América del Norte señala la necesidad de acciones de conservación urgentes

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RESUMEN

Las aves playeras están disminuyendo en mayor medida que muchos otros taxones de aves alrededor del mundo. En América del Norte, las aves playeras, junto con los insectívoros aéreos y las aves de pastizales, tienen algunas de las proporciones más altas de especies en declive de cualquier grupo. Aquí, aplicamos un nuevo modelo bayesiano jerárquico para analizar los datos de monitoreo de la migración de aves playeras de toda América del Norte, desde 1980 hasta 2019, y presentamos las estimaciones disponibles más recientes de tendencias para 28 especies. Las estimaciones puntuales para las tendencias de abundancia en todos los censos fueron negativas para 26 de las 28 especies (93%). A pesar de los desafíos de la baja precisión asociada a los datos de conteo de las migraciones, las tendencias para 19 especies presentaron intervalos creíbles del 95% que fueron completamente negativos. Se estimó que más de la mitad de las especies habían perdido >50% de su abundancia. Además, las tasas estimadas de disminución se han acelerado durante las últimas tres generaciones para la mayoría de las especies. Las estimaciones puntuales de tendencia fueron más negativas para 18 especies (64%) durante el período de tres generaciones más recientes en comparación con el período de tres generaciones anteriores. Muchas especies superan ahora los criterios internacionales para la inclusión en la lista de especies amenazadas. El enfoque analítico utilizado aquí nos permite modelar la variación regional de las tendencias, aunque la cobertura de los censos y la fuerza de la inferencia fueron mayores en las partes orientales de América del Norte (al este de 100°O). Encontramos las mayores disminuciones en los sitios de escala a lo largo de la costa atlántica desde Carolina del Norte hasta Nueva Escocia, y menores disminuciones a lo largo de la costa del Golfo y en la parte central continental de los Estados Unidos. Las disminuciones en las poblaciones de aves playeras reportadas aquí son preocupantes y señalan la necesidad urgente de tomar medidas de conservación. Además, sería beneficioso validar estos resultados mediante la recopilación y el análisis de datos complementarios, e iniciar estudios demográficos a lo largo del ciclo anual para determinar dónde y cuándo es más probable que se originen las disminuciones. Esta información mejorada permitirá el desarrollo de esfuerzos más específicos para revertir las disminuciones a través de acciones de conservación.

Palabras clave: América del Norte, análisis de tendencia, aves playeras, censos de vida silvestre, ciencia ciudadana, disminución poblacional, migración

INTRODUCTION

Around the globe, approximately one million species are threatened with extinction from a combination of land use changes that degrade habitats, direct exploitation, climate-related threats, and other factors (IPBES 2019). The conservation of biodiversity has important intrinsic and extrinsic implications (e.g., Cardinale et al. 2012, Sandler 2012), but conserving threatened wildlife species can be costly and difficult (McCarthy et al. 2012). Protecting species before they are threatened with extinction is widely considered to be both more efficient and more effective (Walls 2018). Biodiversity loss is a "wicked problem," with complex and interrelated causes, and solutions requiring a balance of competing interests (Sharman and Mlambo 2012). While the solutions are complex, a necessary first step is an understanding of which taxonomic groups are being lost at the greatest rates and the locations where the losses are occurring.

Trends in abundance are among the key parameters being monitored to establish extinction risk and the status of biodiversity (IUCN 2012, WWF 2018, 2020), and threshold rates of decline are a primary criterion used to classify species into varying categories of extinction risk in national and international threatened-species evaluation processes, such as the designations of vulnerable, endangered and critically endangered by IUCN (2012).

Birds are a widespread and species-rich component of vertebrate biodiversity. With their comparatively robust monitoring information and their broad public appreciation (Belaire et al. 2015, Whelan et al. 2015), birds are commonly presented as indicators of biodiversity loss (Rosenberg et al. 2019). Among birds, migratory shorebirds are frequently highlighted as a taxon of conservation concern in global (e.g., Stroud 2003, Butchart et al. 2010), hemispheric (Simmons et al. 2015, NABCI 2016), national (NABCI Canada 2019, Rosenberg et al. 2019) and regional (Smith et al. 2020, Warnock et al. 2021) assessments. In the Northern Hemisphere, many species of migratory shorebirds travel long distances from high-latitude breeding grounds to south-temperate or tropical nonbreeding areas. To fuel these long migrations, many species rely on suitable foraging conditions at a restricted network of highly productive staging sites (Myers et al. 1987, Donaldson et al. 2000, Brown et al. 2001). This reliance on a comparatively small area of habitat (Morrison 1983), distributed in space and time across hemispheres, exposes shorebirds to a wide range of threats, from habitat loss or degradation in coastal regions (Pfister et al. 1992, Stroud et al. 2006), to mortality from harvest (Watts et al. 2015, Andres et al. 2022), to disease and pollution (Buehler et al. 2010, McCloskey et al. 2013). This exposure to wide-ranging threats makes shorebird populations susceptible to decline and has led some to consider them sensitive indicators of global environmental change (Piersma and Lindström 2004).

Shorebirds' behavior of congregating at migratory staging sites, however, also presents opportunities for efficient monitoring of their populations. When large numbers of shorebirds aggregate at small numbers of sites in populated coastal regions, it is possible to monitor substantial fractions of the population with relative ease. Because of this, the monitoring of shorebirds at migratory stopover sites has a long history in North America. Coordinated surveys began in the early 1970s in Atlantic Canada, Ontario, and the eastern United States. Initially, these surveys were intended to provide an increased understanding of the distribution and relative abundance, rather than a statistically rigorous estimate of population size or trend (Howe et al. 1989; see also Morrison 2001, Ross et al. 2001). However, they have been used for trend analyses previously, using a variety of analytic methods (Bart et al. 2007, Ross et al. 2012, NABCI 2016, 2019). Non-random site selection, limited data on the length of time that individuals remain at each site, and uncertainty about the proportion of each population migrating through different regions all present challenges for estimating population trends from these data. Nevertheless, "migration monitoring" surveys remain the most systematically collected survey data, and indeed the only widespread survey data, for estimating trends for many shorebird species and thus are a critical tool in the status assessment and conservation prioritization for shorebirds. These monitoring data can also point to possible correlates of decline, through the evaluation of patterns in trends across species and regions.

Here, we present updated estimates of changes in population size for migratory shorebirds in North America based on counts at migration stopover sites in the continental USA and southern Canada from 1980 to 2019. In particular, we tested whether previously reported declines in population size have been worsening or ameliorating over time, and consider the recent trends in the

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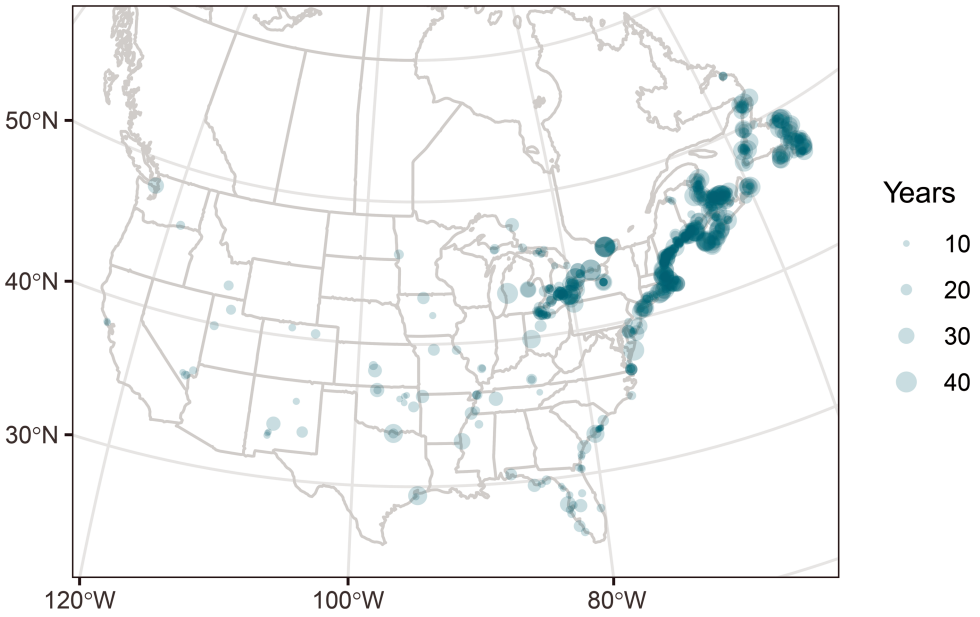


Figure 1. Distribution of survey sites across North America, showing the 668 sites that could be included in one of the analyses here (>10-year span of observations). The size of the points reflects the span of annual monitoring and points are semi-transparent, so darker locations reflect more sites. 2,989 sites were excluded because of an insufficient span of monitoring (i.e., <10-year span of observations; see Supplementary Material Figure S1).

context of thresholds for national and international threatened species designations. We develop and present a novel analytic approach that can accommodate the transient nature of the migrants' abundances, the potential spatial autocorrelation among sites, and the varying degrees of survey coverage among regions and time periods. We consider spatial and interspecific patterns in trends and suggest areas for further research into drivers of decline. We also consider the current status of shorebirds with respect to criteria for endangered species listing and discuss the implications for the conservation of North America's shorebirds and other migratory birds.

METHODS

Field Survey Methods

The dataset consists of shorebird counts from the International Shorebird Survey (ISS), the Atlantic Canada Shorebird Survey (ACSS), and the Ontario Shorebird Survey (OSS). All have been carried out since the early 1970s, with surveys coordinated by Manomet Inc. in the United States and Environment and Climate Change Canada in Canada (see Howe et al. 1989, Morrison et al. 1994, Ross et al. 2012). Surveys are carried out primarily by volunteers, with significant contributions from state and federal protected areas biologists in some regions. Surveyors are asked to visit sites every 10–14 days during the fall migration period between July and November, although not all sites are surveyed with such regularity. Sites are surveyed by one or more observers who count all shorebirds present. Observers are asked to standardize their search effort across visits and for sites with tidal influence, to visit at a tidal stage during which birds are concentrated and easier to count (most often a high and falling tide). Where possible, the boundaries of sites are defined by natural borders to ensure that the area counted in each year is consistent. The boundaries of many sites are described in site catalogs (e.g., Environment Canada 2009) to further ensure this consistency over time.

Survey locations are distributed throughout Atlantic Canada (especially the provinces of Nova Scotia and New Brunswick), the province of Ontario, and throughout the continental United States, with a majority of sites along the Atlantic Coast and far fewer west of the Mississippi River (Figure 1 and Supplementary Material Figure S1). Although surveys of migrant shorebirds have occurred at stopover sites in Prairie and western Canada and Quebec, the coverage during the period 1980–2019 is insufficient for inclusion in these analyses.

Selection of sites for surveys has traditionally been non-random, often based on convenience of coverage by volunteers, and is likely biased towards sites that are easily accessible and consistently used by shorebirds. Survey coverage and intensity have also varied over time (Supplementary Material Figure S2), and analyses are designed to accommodate these missing data (see below). Several efforts have been undertaken to obtain more systematic or random survey coverage, including a project on the Atlantic coast of the United States in 2011–2014 to ensure improved coverage of sites believed to account for 80% of the bird-use days, and efforts in Ontario and Atlantic Canada beginning in 2013 to increase survey effort at randomly selected locations. These efforts have served to improve coverage in some regions, but non-random site selection remains an important consideration with respect to potential analysis methods to minimize bias.

Since 2008, ISS survey coordinators have requested that data be uploaded to eBird (https://ebird.org/) through a specialized project protocol, available to select as an "observation type" within the eBird data upload process. In Canada, since 2012, survey data are uploaded by surveyors to Nature Counts (https://www.birdscanada.org/naturecounts/), and, from there, uploaded to eBird. Thus, data are archived and freely available in a standardized format for future analyses.

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Data Preparation and Filtering

We selected all observations made during the fall migration period, which we defined as survey dates between 1 July and 30 November. The migration monitoring surveys began in 1974, but the spatial and seasonal coverages were much more stable after 1980. We therefore limited our analyses to fall migration seasons in all years from 1980 to 2019. Although spring surveys have been carried out at many sites, coverage is far sparser in space and time.

Our primary aim is to describe the long-term trends in abundance of shorebirds. We present results for all species for which we could fit models that reliably converged. To be included in analyses for a given species, a survey site had to have observations of that species in at least 2 years, spanning a minimum time-frame of 10 years between those two observations. In addition, sites were only included if they were contained within a geographic stratum (defined below) that also met criteria for inclusion. Geographic strata were included if the species had been observed at least twice spanning a minimum time-frame of 20 years (half of the 1980–2019 time-series).

Analytic Methods

Counting migratory animals as they pass through a sampling frame presents a number of analytic challenges, and these challenges are increased when the potential survey sites range in size and density by several orders of magnitude. Because key coastal staging sites are large and well known, the monitoring programs are likely sampling a relatively large proportion of the available coastal sites and the population of shorebirds using those sites. In comparison, inland sites tend to be much smaller and less well known, and monitoring programs are likely sampling a relatively small proportion of the available sites and populations of shorebirds using them. Because the inland area of the continent is vast, the total number of potentially available inland sites is large. Therefore, despite the small counts of birds observed at the inland sites selected for monitoring, the region may actually hold a large proportion of the total species population (e.g., Skagen et al. 2008). Without further information on movements during migration, we cannot know the most appropriate weighting of sites among the major regions.

We set out to estimate population trends and annual indices of abundance under the assumption that the magnitudes of counts at particular sites were not necessarily representative of the proportion of the continental population migrating through that area. We also allowed long-term population trends to vary among geographic strata (defined below) in a spatially explicit way. We modeled counts at each survey site using a hierarchical Bayesian model that estimated smooth nonlinear patterns of population change with additional random annual fluctuations. The model, implemented in R (R Core Team 2021), is similar to the model for the North American Breeding Bird Survey, described in Smith and Edwards (2021), with two key differences: (1) we derive the survey-wide estimates of population change from the means across all geographic strata (hyperparameters) and not an abundance-weighted sum of the stratum estimates; and (2) we use a spatially explicit intrinsic conditional autoregressive (iCAR) structure to share information on population change among neighboring strata. We describe the key points of the analyses below, with complete details, links to model code, and an assessment of model fit to simulated data provided in the Supplementary Materials.

Geographic stratification.

We grouped survey sites into geographic strata to allow the model to estimate varying population trajectories across the continent while sharing information among sites in relatively close-proximity. Sites were grouped into strata defined by hexagonal grid cells ~300 km in width.

We modeled annual migration counts from each site j, in stratum i, day d, and year t as realizations of an overdispersed, Poisson distribution, with mean $\lambda_{j,i,d,t}$. For the year effects, the structure allowed the trajectory of annual indices to depart from the overall smooth or stratum-level smooths in a given year, when such departures were supported by the data. Year effects were not allowed to vary among strata, because there were generally insufficient data to support the extra parameters, in combination with the stratum-level smooths (below), the site-level intercepts, and the relatively unbalanced sampling through time.

Seasonal smooths.

The component of the model that adjusts for variation in mean counts over the course of the fall migration season ($\zeta(d)$) was estimated as a semi-parametric GAM smooth. We used $\Omega = 10$ knots, spread evenly over the 150-day season, to allow the seasonal pattern to be sufficiently flexible to accommodate more than a single peak, if supported by the data. For some species, we estimated two separate seasonal patterns for the northern and southern portions of the survey area, if preliminary investigations of the data suggested that this distinction was warranted (Supplementary Material Figure S3).

Temporal smooths.

The time series components $\delta_i(t)$ in the model (the smoothed population trajectories through time in each stratum) were estimated with a semi-parametric GAM smooth. We used a comparable approach to the hierarchical GAM used in Smith and Edwards (2021), where stratum-level smooths were estimated as additive combinations of a survey-wide smooth that reflects the species' overall smoothed population trajectory, and stratum-level smooths that reflect local departures from that survey-wide smooth.

Neighborhood relationships.

Although the strata were defined using a regular hexagonal grid, not all grid cells contained survey sites that could contribute to the analysis for any given species. Therefore, we defined spatial neighbors more broadly than just grid cells sharing an edge, to ensure that the adjacency matrix would be fully connected. We defined the spatial neighborhood relationships using a Voronoi tessellation of the centers of the hexagonal grid cells that contributed data to the analysis for a given species (Supplementary Material Figure S4).

Population trajectories.

The survey-wide population trajectories are the collection of estimated annual indices of abundance (N_t). These values are exponentiated sums of the mean survey-wide temporal smooth ($\Delta(t)$), the species intercept (α), the survey-wide year-effects (γ_t), the mean of the seasonal effects ($\bar{\zeta} = \sum_{d}^{D} \zeta(d)/D$), and variance components to account for the asymmetries of the log-normal retransformation ($\sigma^2_{\psi} \times 0.5 + \sigma^2_{\varepsilon} \times 0.5$)

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</mathgraphic>. We also calculated a smoothed population trajectory based on annual indices of abundance without the year-effects, which includes an additional variance component to account for the variance of the year-effects ($\sigma^2_\gamma \times 0.5$).</mathgraphic> These smoothed population trajectories provide an estimate of the medium and long-term patterns of population change after removing the effects of the random annual fluctuations and form the basis of our trend calculations.

Stratum-level population trajectories ($n_{i,t}$) were calculated in the same way except that the time-series smooth component was provided by the stratum-level smooths ($(\delta_i(t))$,</mathgraphic> and we accounted for the variance in abundance among sites by generating predictions for the set of sites included in stratum i, $(s \in S_i)$</mathgraphic> then averaging the predicted values across those sites. Similar to the survey-wide estimates, we also calculated smoothed population trajectories, without the annual fluctuations. See Supplementary Material Appendix S1 for additional details.

Trends.

We calculated population trends as geometric mean annual changes (%/year) in the estimated annual indices over specific time intervals, using interval-specific ratios of the smoothed annual indices (similar to the methods used in Fewster et al. 2000, Smith and Edwards 2021).

The interval trend from year t_a to year t_b for the survey-wide population was

$$\text{Trend}_{t_a,t_b} = 100 \times \left(\left(\frac{NSmooth_{t_b}}{NSmooth_{t_a}} \right)^{1/t_b - t_a} - 1 \right),$$

and the stratum-specific trends were calculated similarly using the values of $nSmooth_{i,t}$.</mathgraphic>

These interval trends estimate the average medium- to long-term rates of change in the surveyed portion of the species' population, after adjusting for the random annual fluctuations. This particular estimate of trend is useful because it allows for non-linear patterns of population change, so the estimates of short-term trends can provide additional information to the estimates of long-term trends. In addition, trends are relatively stable between adjacent years, because the smoothed trajectories have already been adjusted for random annual fluctuations.

We report trends over the entire study period, 1980–2019, and also over species-specific periods of three generations. The magnitude of declines observed over a three-generation period (where generation time is defined as the mean age of parents of the current cohort) is an international benchmark for identifying species of conservation concern, used by the International Union for Conservation of Nature (IUCN 2012), the Canadian Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2020a) and other conservation listing organizations. We obtained generation lengths from Bird et al. (2020; Supplementary Material Table S1) and reported trends from the most recent three generations (rounded to the nearest year, to match the trend data) and contrast these with trends from the previous three-generation period. The difference between the recent and the previous three-generation trends was calculated as a derived statistic from the modeled trend estimates for the two different time-periods ($\text{Trend}_{\text{recent}} - \text{Trend}_{\text{previous}}$) and the posterior distribution of this difference was used to estimate the probability of a worsening trend (i.e., the proportion of the posterior distribution that was negative). The duration of three-generation periods for the species considered here ranged from 10 years for Wilson's Phalarope and Solitary Sandpiper, to 23 years for the Black-bellied Plover and Marbled Godwit, with a mean ± SD of 14.7 ± 4.3 years. For species with three-generation times longer than half of the available time-series (i.e., >20 years), the previous three-generation trend was calculated using the remainder of the time-series (i.e., from 1980 to the beginning of the recent three-generation time period).

Regional patterns in trends.

To explore regional patterns in trends, we used an additional hierarchical model to calculate the mean difference between stratum-level and continental trends in each geographic stratum, across all of the species with trend estimates in that stratum (i.e., grid cells). For each species that occurred in a given stratum, we calculated the difference between the stratum-specific and continental estimates of trend. We used these species and stratum-specific differences in trend to summarize the spatial patterns in trends while controlling for each species' overall trend estimate.

For a given stratum, these species-specific trend differences and the standard deviations of their posterior distributions provided the data for a simple hierarchical model that estimated the mean difference across all species in the stratum, while accounting for the uncertainty of each estimated difference. This post-hoc model was applied independently within each stratum and for each trend estimate (e.g., the mean long-term trend was modeled independently of the mean three-generation trend). We then estimated the probability that this mean trend difference was positive or negative as the proportion of the posterior distribution that was above or below 0. See Supplementary Material Appendix S2 for additional details.

RESULTS

Between 1980 and 2019, there were sufficient data to produce trend estimates for 28 shorebird species. For these 28 species, surveyors observed a total of 69.6 million individuals during 82,843 surveys of 3,657 sites during the fall migration period. Most sites were not surveyed frequently enough to be included, but 668 sites contributed data to trend analyses for at least one of the species included here (Figure 1). Semipalmated Sandpiper was by far the most commonly recorded species, with more than 32 million individuals counted over the course of the study. The next most abundant species, Sanderling and Semipalmated Plover, had ~2 million individuals each, while an additional 5 species had >1 million individuals observed (Table 1).

Survey effort was greatest in the northeastern United States and Atlantic Canada, the regions in which these volunteer survey programs were initiated (Figure 1). Within these two regions, ~200 sites per year were surveyed, which was more than for all other portions of North America combined. Importantly, a majority of the sites with consistent coverage across the duration of the study period are also from these regions.

Trend Analyses

Trends were estimated for 28 species (Supplementary Material Figure S5), and point estimates for survey-wide

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Table 1. Relative abundance and filtered sample sizes for species included in analyses of trend.

Species	Total number observed	Mean number observed per included survey	Mean number of surveys included per year	Number of sites included in analyses
American Avocet	312,180	51.5	124.9	22
American Golden-Plover	17,166	0.7	594.2	80
Baird's Sandpiper	75,797	3.2	498.7	52
Black-bellied Plover	1,015,989	28.9	905.2	302
Buff-breasted Sandpiper	2,798	0.2	309.3	28
Dunlin	1,337,094	42.1	763.8	148
Greater Yellowlegs	371,797	9.5	1008.2	347
Hudsonian Godwit	25,152	1.4	442.0	67
Killdeer	521,762	15.0	865.7	182
Least Sandpiper	1,539,243	38.0	984.0	291
Lesser Yellowlegs	922,697	24.5	918.4	262
Long-billed Dowitcher	728,843	40.0	373.7	37
Marbled Godwit	7,971	1.5	155.0	26
Pectoral Sandpiper	463,199	14.7	753.5	124
Piping Plover	23,301	2.2	273.4	75
Red Knot	375,328	16.1	549.3	107
Ruddy Turnstone	133,881	4.8	732.2	196
Sanderling	2,116,058	70.6	803.0	215
Semipalmated Plover	1,911,201	48.4	1026.8	377
Semipalmated Sandpiper	32,648,810	859.3	987.3	324
Short-billed Dowitcher	1,104,313	34.8	837.4	212
Solitary Sandpiper	12,396	0.5	556.1	66
Spotted Sandpiper	69,163	2.0	850.9	198
Stilt Sandpiper	625,473	28.0	470.1	64
Whimbrel	33,558	1.9	487.7	89
White-rumped Sandpiper	149,463	5.5	678.9	153
Willet	125,431	6.9	485.1	135
Wilson's Phalarope	61,807	4.9	257.8	36

trends in abundance from 1980 to 2019 were negative for 26 of 28 species (93%). Estimated total percent change over the 40-year period ranged from a loss of 94% for Red Knot (95% credible interval (CI): –97% to –87%) to a highly imprecise estimated increase of 15% (95% CI: –27% to +95%) for Willet. More than half of the species were estimated to have lost >50% of their abundance. Credible intervals spanned 0 for 9 of 28 species (32%), including both species for which trend estimates were positive (Figure 2).

The rates of decline in abundance were even more substantial over the most recent three-generation period for a majority of species. Point estimates of trend were more negative for 18 species (64%) during the most recent three-generation period in comparison to the previous three-generation period (Figure 3). Among these species, the evidence of worsening trends was strong (>85% probability, based on the posterior distribution of the difference) for 13 of the 28 species (46%). When converted to total percent change over the duration of the species-specific, three-generation periods, point estimates of decline exceeded a 30% threshold for 19 species (68%) and a 50% threshold for seven species (25%; Figure 4). These decline thresholds, coupled with the prospect of ongoing threats, correspond to key criteria for IUCN listing as "Vulnerable" and "Endangered," and also the Canadian COSEWIC listing criteria of "Threatened" or "Endangered."

The declines in the most recent three-generation period are centered primarily in the eastern portion of the study area, from South Carolina on the Atlantic coast of the United States, to Atlantic Canada, and inland to Ontario (Figure 5A). Lesser declines were observed in the midcontinent of the United States and on the Atlantic and Gulf Coasts of the southern United States. This regional variability is more pronounced than was the case in the previous three-generation period (Figure 5B). Although survey effort has changed over time, including a reduction of effort at inland and western areas in recent decades, this should not explain the increased certainty of greater declines at eastern sites.

Passage Dates

The timing of migration varied widely among species, and, for some species, between northern and southern portions of the study area. For many species, abundance increased throughout July; beginning in early July for temperate and boreal breeders and in mid- to late July for Arctic breeders.

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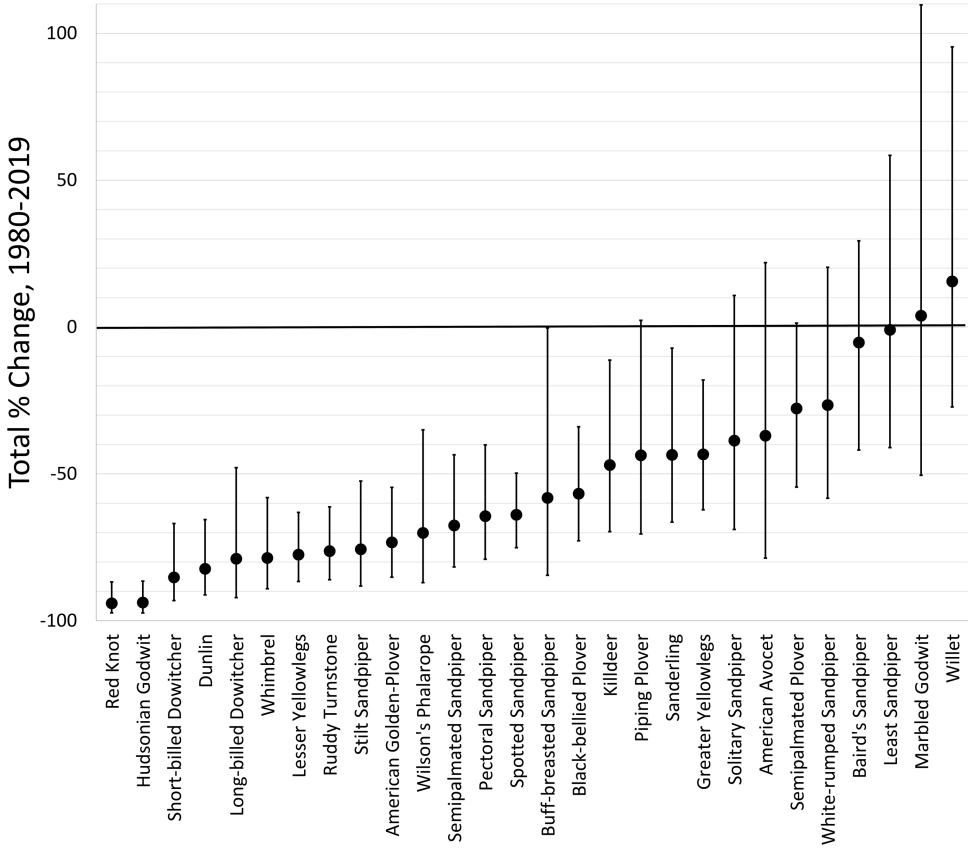


Figure 2. Estimated total percent change in abundance (means ± 95% credible intervals) for 28 species of shorebirds surveyed during fall migration across North America, 1980–2019.

Abundance for many species reached a peak in early August, although some species peaked in abundance much later, as late as late October in the case of Dunlin (which moult at northern breeding or staging grounds). For some species, such as the White-rumped Sandpiper, a second peak a month or more later was observed, presumably reflecting the peak passage for later migrating juveniles. This peak of juvenile migration was not clearly discernible in all species.

We identified a later and more protracted period of passage through the southern portion of the study area for 14 of the 28 species (Supplementary Material Figure S3). With one exception, these were all species for which the southern portion of the study area is within the stationary nonbreeding range. The one exception, Hudsonian Godwit, passed through the southern portion of the study area in October, perhaps reflecting a different segment of the population for this species with a disjunct breeding range (Senner 2012).

DISCUSSION

Our results reaffirm the urgent conservation status of shorebirds in North America and provide new insights into the species and regions showing the greatest declines. Importantly, we show that the declines are large and accelerating for a majority of species, signaling the need for immediate attention. Regional variation in migration behavior and trends, with protracted passage periods and appearance of lesser declines in the southern portion of the study area, suggest the possibility that some birds are spending the non-breeding period farther north, perhaps as a consequence of climate change. Although these represent the best available estimates of trends for most North American shorebirds, these migration surveys are not without weaknesses. Many of the trend estimates have broad credible intervals, survey coverage is greatest in eastern North America, and several sources of potential bias could influence counts irrespective of population change. Understanding and addressing these weaknesses should be a priority to increase confidence in the results and target conservation action towards the species and locations where it is most urgently needed.

Large and Accelerating Declines

We report declines for nearly all of the species studied; point estimates were positive for only 2 of 28 species, and in both of these cases, the credible intervals were very large. Moreover, the estimated declines were large in most cases, with 16 of the 28 species estimated to have lost 50% or more of their abundance over the 40-year period analyzed. Migration surveys such as these are vulnerable to several important sources of bias, discussed below. However, the ubiquity and magnitude of the declines reported here provide strong evidence for widespread declines among North America's migratory shorebird species.

Alternative sources of monitoring information with which to corroborate these results are few and far between. Previous large-scale analyses reporting broad declines in shorebird abundance, such as in NABCI (2016, 2019), make

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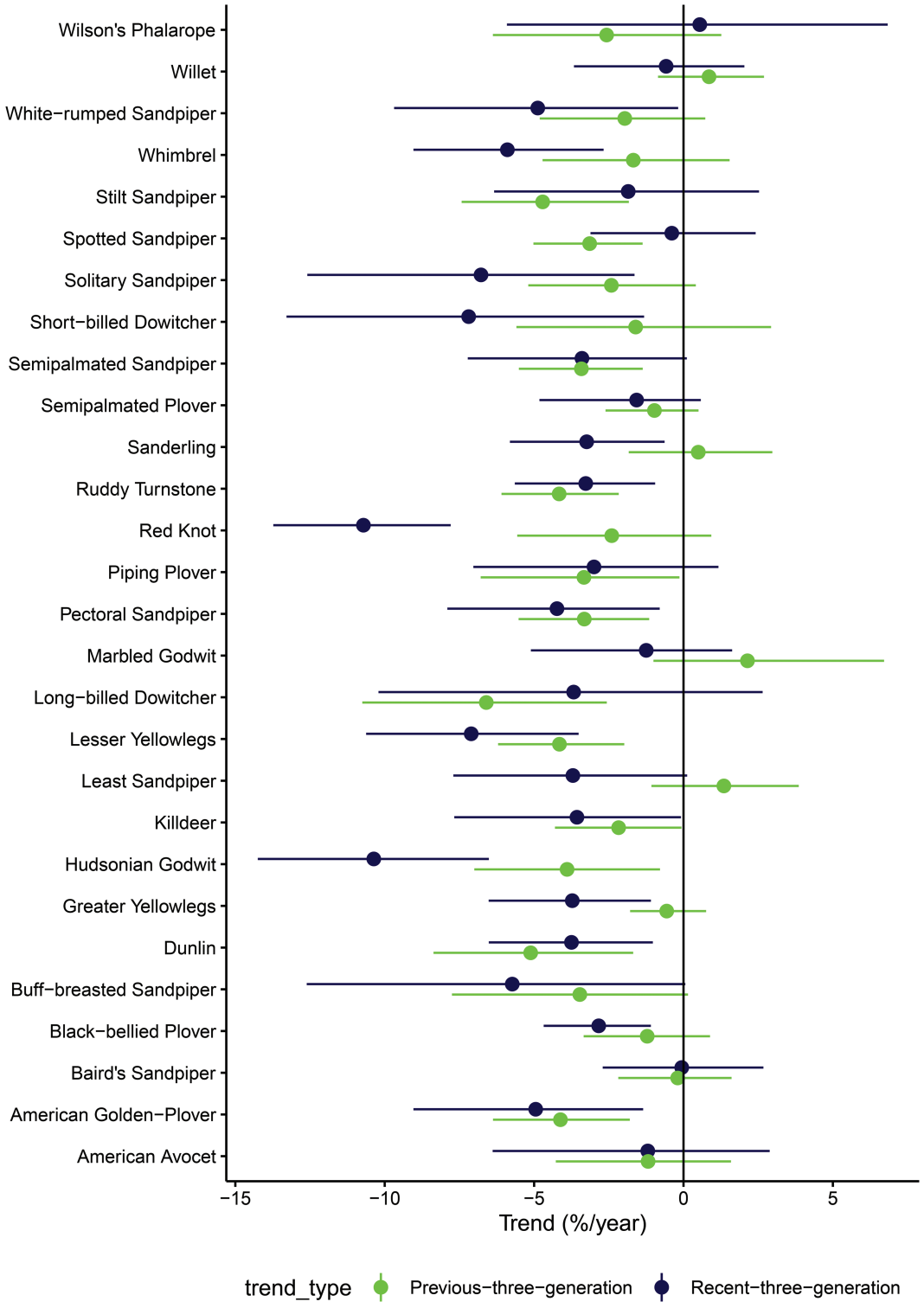


Figure 3. Annual percent change (means ± 95% credible intervals) in abundance of 28 species of shorebirds for the most recent three-generation period ending in 2019, and the three-generation period prior to that. The rate of decline is accelerating for a majority of species.

use of these same ISS data, and agree with the general conclusions reported here. Similarly, site- or species-specific assessments of trends in abundance at migratory stopover sites are often based on subsets of these data (e.g., Harrington et al. 2012). ISS, ACSS, and OSS surveys have also been carried out in spring, and several shorebird species take different migration routes in spring vs. fall ("elliptical migration", e.g., Gratto-Trevor and Dickson 1994). Despite the reduced sample sizes in spring, these spring data offer a largely unexplored opportunity to assess trends at different stages of the annual cycle. However, truly independent data, such as long time-series of observations from the breeding and stationary nonbreeding grounds are rare. For Semipalmated Sandpipers, aerial surveys of nonbreeding birds along the

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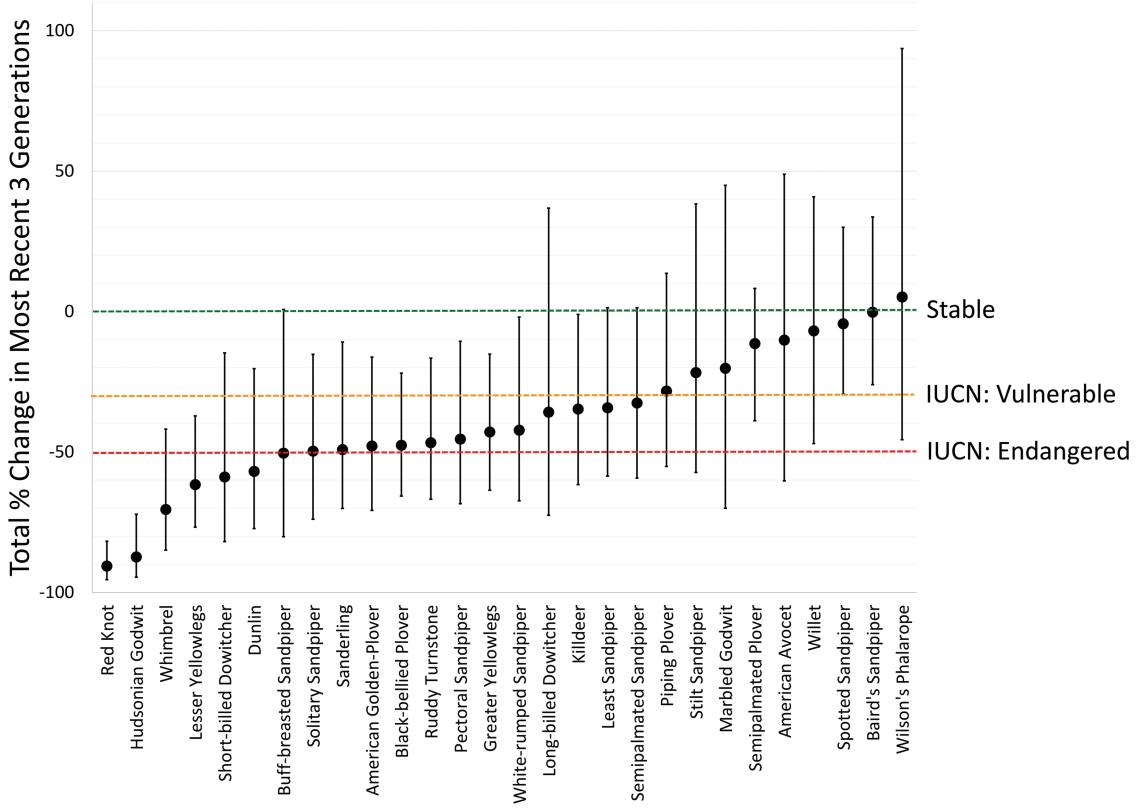


Figure 4. Total percent change in abundance over the most recent three-generation period ending in 2019 (±95 credible intervals) for 28 species of shorebirds surveyed during migration through North America in fall. Thresholds of decline of 30% and 50%, used in international conservation prioritization processes, are shown for reference.

coast of the Guianas have documented a 79% decrease in abundance between 1982–1986 and 2008–2011 (Morrison et al. 2012). However, observations on the breeding grounds suggest mixed population trends, with large decadal declines at several sites in the eastern portion of the range, and variable trends including local increases in the western and central portions of the range (Smith et al. 2012, Brown et al. 2017). Surveys of nonbreeding Red Knots in southern South America have documented dramatic declines (Morrison et al. 2004, COSEWIC 2020b), of a magnitude consistent with those reported here, but no long-term monitoring data are available for the Arctic breeding grounds. Inuit knowledge suggests large declines in the abundance of shorebirds in the Kivalliq region of Nunavut (Carter et al. 2018), and the number of Ruddy Turnstone nests monitored in a fixed study area within this region (at Qaqsauqtuuq/East Bay, Nunavut, Canada) has dropped from a high of 40 nests in 2002 to 4–11 nests per year in 2015–2019 (P.A.S. personal communication). In general, existing sources of monitoring information for shorebirds from the breeding and nonbreeding grounds are either too short-term or too small-scale to be definitive. However, the reports of declines greatly outnumber the reports of increases, consistent with the results presented here.

More worrying still is the observation of accelerating declines. We report that declines are accelerating for 18 of 28 species, with strong evidence of accelerating declines for 13 of these species. The rates of decline in the most recent three-generation period are rapid, exceeding internationally recognized thresholds for conservation status for 19 of the 28 species analyzed. These threshold rates of population decline were devised by the International Union for the Conservation of Nature (IUCN) to describe the risk of extinction, on the assumption that species showing large declines and ongoing threats are expected to continue their decline to extinction (Mace et al. 2008). These decline-based thresholds for threatened species listings have at times been controversial, for example when abundant and wide-ranging species have been listed based on past declines that are stabilizing (Webb and Carillo 2000, Mace et al. 2008). For the shorebird species discussed here, population sizes still number in the hundreds of thousands or more in most cases (Andres et al. 2012), and the risk of extinction would be eliminated if the declines were halted. However, the accelerating declines observed for a majority of species provide no evidence to suggest that population trends are stabilizing. Early conservation action to reverse declines before species become rare is widely understood to be both more efficient and more effective (e.g., Walls 2018).

Regional Variability in Trends

The declines we report here are widespread but are most pronounced in the eastern United States and parts of Atlantic Canada. This pattern is particularly evident in the most recent three-generation period, where much of the Atlantic coast of the United States north of the state of North Carolina, eastern Ontario, Canada, and parts of New Brunswick and Nova Scotia, Canada, showed trends that were at least 2.5% per year more negative than the mean trends. This pronounced regional variability could arise from at least two sources: (1)

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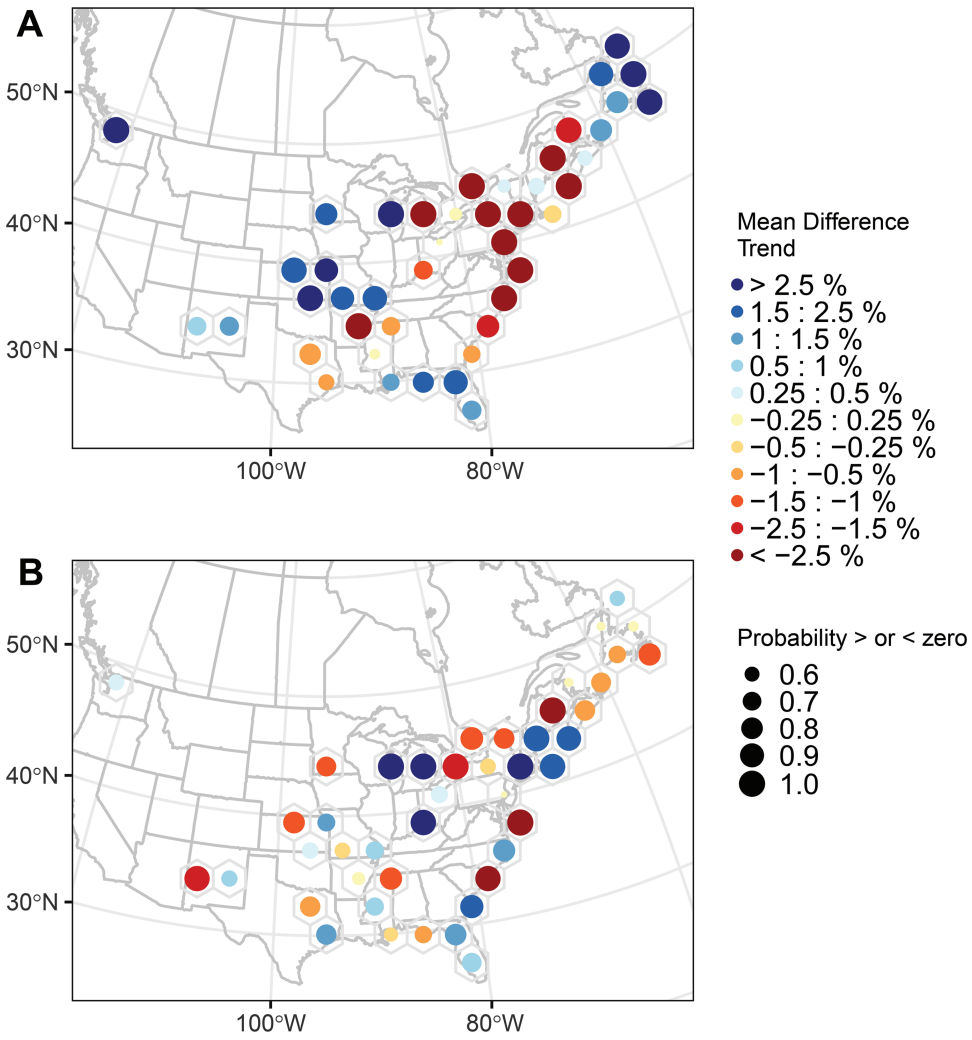


Figure 5. Regional variability in trends across species, expressed as the estimated mean of the species-level differences in stratum-level trend, relative to the species' continental estimate (expressed in % difference per year, where +2.5% can mean 2.5% less negative). The size of the icons reflects the posterior probability that the mean deviation across species is positive (cool colors) or negative (warm colors). Results are presented for the most recent three-generation period (A) and the previous three-generation period (B).

redistribution in response to regional sources of disturbance, threat, or environmental change; and (2) different trends among distinct segments of the population passing through these regions.

Redistribution of birds among sites is known to occur as a consequence of disturbance. For example, in Atlantic Canada between 1974 and 2017, migrant shorebirds increasingly aggregated at the largest and safest stopover locations, as pressure from introduced Peregrine Falcons (*Falco peregrinus*) increased (Hope et al. 2020). Changes in food resources can also affect distribution among sites. For example, Red Knots in Delaware Bay are well known to alter their distribution within and among seasons in response to the local abundance of the eggs of horseshoe crabs (*Limulus polyphemus*), a preferred food (Karpanty et al. 2006). This among and within site redistribution could lead to potential bias in our trend estimates (see below) but would not explain the regional-scale variation in trends that we observed.

Evidence for redistribution of birds at regional or flyway scales is far less common. Afro-Eurasian Ruffs (*Philomachus pugnax*) have shifted their global range eastwards in response to reduced habitat quality at staging sites in the western portion of their migratory range (Rakhimberdiev et al. 2011, Verkuil et al. 2012). The Richard's Pipit (*Anthus richardi*), a migratory songbird breeding in Siberian grasslands and traveling to Southeast Asia, has recently adopted a new migration route and is now regularly sighted in western Europe, perhaps as a consequence of large-scale changes in climate (Dufour et al. 2021). Similarly, Rufous Hummingbirds (*Selasphorus rufus*), which breed in the western United States and Canada and migrate to Mexico, were observed only as migrants in western North America until the 1970s, after which time they became increasingly common as wintering birds along the coast of the Gulf of Mexico and the Atlantic coast of the southern United States (Hill et al. 1998). While similar large-scale shifts in migration routes are possible for the shorebirds studied here, there is little evidence to support this possibility. And regardless, because most regions are declining (albeit to varying extents), the potential for redistribution does not alter the interpretation of population-level declines.

Perhaps more likely is that the regional patterns in declines arise from differing population trends in the subpopulations, or segments of the populations, using these areas. Previous studies have shown larger declines in more easterly breeding

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populations of Semipalmated Sandpipers (Smith et al. 2012). The breeding range of Semipalmated Sandpipers in the Eastern Canadian Arctic overlaps to a large extent with hyperabundant populations of Snow Geese (*Chen caerulescens*). The habitat damage caused by overabundant geese could be limiting the sandpipers' survival or reproductive output from this portion of the range (Flemming et al. 2016). Several other threats are also concentrated in eastern or coastal regions. For example, shorebird species are exposed to potentially unsustainable rates of harvest in the Caribbean and northeastern coast of South America (Watts et al. 2015, Watts and Turrin 2016). Declines in the Lesser Yellowlegs (*Tringa flavipes*), for example, have been suggested to be associated with the exposure to this harvest in the Atlantic Flyway (McDuffie et al. 2021). Beaches and other coastal areas in the Atlantic Flyway are also subject to significant human disturbance (Pfister et al. 1992), habitat modification such as shoreline hardening (Prosser et al. 2018), overfishing with direct or indirect effects on resources for foraging shorebirds (Niles et al. 2009), and other threats. Loss and degradation of key habitats at migration staging areas in the Yellow Sea have been shown to underlie the large declines in the abundance of shorebirds in the East-Asian Australasian Flyway (Studds et al. 2017), and similar mechanisms could be operating to create disproportionate risks for shorebirds using the Atlantic flyway. However, other flyways are not without threats, such as the ongoing loss of wetland and native grassland habitats in the midcontinent (Environment Canada 2013), and a comparison of relative threats or mortality among flyways has not been attempted.

Declines were less pronounced in the most southern portions of our study area, in the Southern United States and Gulf Coast. We also identified a later and more protracted period of passage through this portion of the study area for 14 of the 28 species. With one exception, these were all species for which the southern portion of the study area is within the stationary nonbreeding range. The protracted passage and lesser declines in the south could suggest birds lingering or spending the boreal winter farther north as the winter climate warms (La Sorte and Thompson 2007). This range shift, with more birds wintering farther north and therefore remaining within our study area, could give the appearance of a lesser decline in abundance for these species, irrespective of the overall rate of population decline.

Sources of Potential Bias

These trend estimates are the best available evidence and suggest large and widespread declines. However, there are important sources of potential bias that should not be ignored, including changing lengths of stay at stopover sites and redistribution of birds from surveyed to non-surveyed areas. Changes in the length of time that individuals remain at a stopover site directly influence the counts at that site, irrespective of actual trends in population abundance. Counts of Western Sandpipers at a study site in British Columbia declined by 18% per year between 1992 and 2001. However, this dramatic apparent decline could be explained by the observed four-fold decline in the length of stay at this site in response to increased disturbance and predation risk from an increasing population of Peregrine Falcons (*Falco peregrinus*; Ydenberg et al. 2004). Peregrine Falcons have also increased in abundance in coastal regions of eastern North America, and are altering the behavior of migrant shorebirds there. At coastal sites in Virginia, for example, Red Knots avoid using stopover sites in the vicinity of active Peregrine Falcon nesting platforms (Watts and Truitt 2009).

Reduced lengths of stay in response to the increasing abundance of Peregrine Falcons could create the false appearance of population declines. However, the small amount of evidence available at present does not support this hypothesis. Radio-telemetry studies in the Bay of Fundy showed that stopover duration of Semipalmated Sandpipers has not decreased, but rather increased from ~2 weeks in the 1980s to 3 weeks in the 2010s, during which time passage population estimates have declined by 50% (Neima 2017). Additional work is needed to estimate current lengths of stay at key stopover sites, for example using available MOTUS telemetry (Taylor et al. 2017) data or other tracking technologies, and to compare these values to the fragmentary historical data.

Redistribution of birds is another important source of potential bias, but as for length of the stay, current information does not support that this bias is leading to a false impression of population declines. A net shift of birds away from surveyed sites to non-surveyed sites over time would lead to reduced survey counts and appear as a population decline. This pattern could arise if, for example, habitat change or disturbance caused birds to shift away from large, traditionally important sites in favor of smaller, more dispersed sites that are less likely to be monitored (Bart et al. 2007). While this bias is plausible, there is no evidence to suggest that it is occurring. For northeastern portions of the study area, birds in fact appear to be increasingly aggregated at larger sites (Hope et al. 2020). Conversely, birds passing through interior areas such as the prairie potholes have always exhibited variable site use, in response to the availability of wetlands (Skagen and Knopf 1994, Skagen et al. 2008), and there is no indication that this variability has changed over time.

Survey coverage in the midcontinent region, and especially in regions farther west, is sparser in space and time than in more eastern portions of the study area. While this could add uncertainty to the overall trend estimates, the hierarchical nature of the model safeguards against bias or undue influence of these more sparsely sampled regions. Nevertheless, improved coverage of these migration surveys in the west would serve to provide a more complete picture of range-wide population status.

These and other sources of potential bias should be considered carefully. However, with large declines observed in the counts of 26 of the 28 species studied, the weight of evidence unequivocally suggests widespread population declines.

The Need for Urgent Action

We suggest that our results indicate a clear need for urgent conservation action. The worsening rates of decline for most species show that our existing conservation efforts are insufficient. The success of the American Oystercatcher Recovery Initiative in halting the decline of this species, and then achieving a 23% increase in the population along the eastern coast of the United States between 2009 and 2019 (Macdonald 2021), shows that focused conservation action based on a clear understanding of factors limiting population growth can successfully restore shorebird populations.

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Many of the potential conservation actions needed by North America's shorebirds will require additional investment. Flyway-scale conservation plans have been developed to guide these investments (e.g., AFSI 2015, Senner et al. 2016), but none of these plans has yet succeeded in garnering the financial support necessary for the proposed actions. Taking action earlier helps to avoid the much larger costs associated with attempting to recover a species after it becomes severely depleted (e.g., Martin et al. 2012, Walls 2018).

The species considered here are on a trajectory towards endangerment, with 19 of the 28 species considered showing declines that exceed At Risk listing thresholds for IUCN and COSEWIC. Formal evaluations should be carried out by the endangered species programs in Canada, the United States, and other countries within these species' ranges, to increase the available funding and legal mechanisms for conservation. However, conservation action in the interim could lead to more effective and efficient outcomes. Targeted research is also critically important to improving confidence in monitoring results, including better estimates of stopover durations and their potential contribution to observed counts, and demographic research to pinpoint locations and timing of population bottlenecks. This latter aspect, in particular, demographic studies throughout the whole annual cycle, could help to focus conservation action in space and time and make the challenge of conserving these globe-spanning species more tractable.

Supplementary material

Supplementary material is available at *Ornithological Applications* online.

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Author contributions

P.A.S., B.H., R.I.G.M., S.B., and A.C.S. conceived the idea, design, experiment (supervised research, formulated question or hypothesis). C.F., J.P., and B.W. collected the data and conducted the research. All authors wrote the paper. A.C.S. and P.A.S. analyzed the data.

Data availability

Survey data are freely available via NatureCounts (https://naturecounts.ca/nc/default/searchquery.jsp) and eBird (https://science.ebird.org/en/use-ebird-data/download-ebird-data-products). Model code and analysed dataset are available at Smith et al. (2023).

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Exhibit G

The Wayback Machine - https://web.archive.org/web/20200716205545/https://blogs.massaudubon.org/wellfleetbaycitizenscien...

A Mass Audubon Blog

Horseshoe Crabs and Red Knots—An Old Cape Cod Connection?

Posted on April 28, 2015 by Jenette

Sanctuary Director's Message: May 2015

Spring! I think we understand the concept, but it's something we rarely see on the Outer Cape. This year, it looked like it wasn't going to be even a remote possibility.

Having said that, the first of the salamanders have migrated and piping plovers and osprey are returning. Water temperatures, however, are still cold and I think it will be a while before the first of the horseshoe crabs come in with the tides and begin to lay their eggs–an event that has been going on since the glacier created Cape Cod 25,000 years ago and sea levels started to rise.



Breeding horseshoe crabs are far more plentiful in Orleans than Wellfleet

In Wellfleet, we have little reason to think there will be any noticeable increase in the horseshoe crab population. They're not going to go extinct, but they show no signs of recovering. There is one bright spot in some Massachusetts Department of Marine Fisheries data from a survey last fall that showed a slight upward tick. Maybe we'll see more crabs once spawning begins in May and June.

There is a new player in the horseshoe crab story. The Red Knot, whose dependence on horseshoe crab eggs is well known in New Jersey and the mid-Atlantic but largely undocumented in Massachusetts, was recently listed as a federally-protected threatened species.



Red Knots feeding on horseshoe crab eggs at Delaware Bay (photo by Greg Breese, USF&W)

The horseshoe crab and Red Knot connection may have been ruptured in the 1800s and only now are we seeing them re-connect. We might be seeing more spring Red Knots as they feed on horseshoe crab eggs at Nauset, South Beach, and Monomoy where horseshoe crabs are protected and populations of crabs are the highest levels recorded in the state. This is pure speculation on my part, but it has been percolating for a while as more information has come in from multiple historical sources.

In 1850, there was a report from a market hunter (they used to shoot lots of shorebirds for food for Boston residents, but that's another story) of over 25,000 Red Knots on Billingsgate Island. They wouldn't have been there if there weren't either horseshoe crab eggs in the spring or tiny blue mussels around the remaining oyster banks. This is truly a fascinating story that is just beginning to be teased out.

We hunted the Red Knot and other shorebirds, like the Eskimo Curlew, to the edge of extinction and harvested horseshoe crabs for fertilizer and pig food in the 1800s and early 1900s. Those are facts. Then we wonder why the Red Knot no longer feeds in Massachusetts during its spring migration. As I said, maybe we are seeing the restoration of this ancient connection that was lost over 150 years ago.

Bob Prescott
Director, Wellfleet Bay Wildlife Sanctuary

This entry was posted in Updates on April 28, 2015 [https://web.archive.org/web/20200716205545/https://blogs.massaudubon.org/wellfleetbaycitizenscience/horseshoe-crabs-and-red-knots-an-old-cape-cod-connection/] by Jenette.

Leave a reply

Exhibit H

Jason Carmignani, Aquatic Biologist
Mike Nelson, Invertebrate Biologist
MA Wildlife Natural Heritage and Endangered Species Program
MassWildlife Field Headquarters
1 Rabbit Hill Road, Westborough, MA 01581

July 11, 2023

Dear Massachusetts Natural Heritage and Endangered Species Program Staff:

I am writing to help inform your process toward possible listing of the American Horseshoe Crab (Limulus polyphemus) as a Special Concern Species under the Massachusetts Endangered Species Act. Please accept this short letter as preliminary findings in Manomet's early efforts to recognize and study the value of horseshoe crab eggs as a food resource for shorebirds in Massachusetts and New England.

Background:
Manomet Staff is working diligently to reverse current, steep, negative trends for many North American shorebirds, including several species found in Massachusetts. We are working on many conservation issues involving shorebird habitat and food resources throughout North, Central, and South America, and think that understanding and protecting the food resources for these birds is paramount to stabilizing the populations everywhere shorebirds travel. Red Knot, Hudsonian Godwit, Whimbrel, Semipalmated Sandpiper, and Ruddy Turnstone are of particular focus for us in Massachusetts as these birds move through and stopover in the state on their extensive migrations.

For the most recent conditions of many shorebird populations, please see a recent paper lead by our partners in Environment and Climate Change Canada, **Accelerating declines of North America's shorebirds signal the need for urgent conservation action (**https://academic.oup.com/condor/article/125/2/duad003/7031074). We want to engage and work diligently with states, provinces, and countries throughout the full life-cycle migrations of these birds to stabilize and eventually reverse these plummeting populations. We hope you can join us in this monumental effort. Including the horseshoe crab on your list of Species of Special Concern can be a first step in this effort.

I have heard recently that conventional wisdom among Massachusetts coastal interests, including some in state government positions, and even independent scientists suggests that horseshoe crab eggs are not important to shorebirds as a food resource in Massachusetts. From what we know about shorebirds, and the importance of horseshoe crab eggs to shorebirds in other states along the Atlantic, this dismissal of biological values seemed odd. Now, after what we have observed over the past two spring seasons, with additional observations over the last decade, I would like to dispute this belief to say that the eggs of horseshoe crabs appear to be at minimum, an important food resource for several species of migrating shorebirds in Massachusetts. We have documented enough to launch into a much more comprehensive inquiry assessing the value of horseshoe crab eggs to shorebirds in this state.

Our Initial Findings:
In early June, 2022, we were assisting with an international shorebird survey (ISS) on the Monomoy NWR under a USFWS Special Use Permit, and found what we estimated to be 800 Ruddy Turnstones (*Arenaria interpres*) in the vicinity of Minimoy Island on the western flank of the NWR. The birds were clearly feeding on horseshoe crab eggs along exposed bars and intertidal margins of dry sand areas. Turnstones are somewhat unique among shorebirds in their ability to excavate horseshoe crab egg clusters in dry sands, well above the saturated sediments of neap-tidal inundation that tends to limit

other species from accessing the eggs. Telltale indications of turnstones feeding on buried eggs include focal digging spots that are distributed across beach margins in a pattern that is apparently related both egg cluster density and conspecific aggression between the turnstones. The digging and flinging of sand dislodges the eggs from the top section of the egg chamber creating feeding opportunity for the turnstones and other shorebirds such as Sanderling, Red Knot, and Semipalmated Sandpiper to name a few. Please see photos 1 - 5 below for images of this feeding activity.

Based on the 2022 observation of Turnstones, we again conducted ISS surveys on Monomoy NWR on May 23, 2023 and June 1 under Brian Harrington's Special Use Permit (SUP), but due to weather conditions, and neap tides on our May trip, we were restricted to visiting the intertidal flats and margins associated with the west side of North Monomoy only. We witnessed a mini feeding frenzy there during our survey on incoming tide. Photos are included in the following pages of this letter. We estimated that 1,200 Ruddy Turnstones, 700 Dunlin, 265 Red Knots, 400 Sanderlings, and about 120 Black-bellied Plovers were all feeding on horseshoe crab eggs on N Monomoy from the spawning events of the previous days and nights. So, we calculated approximately 2,685 shorebirds in this northern section of the refuge when on this day. We speculated that doubling or even tripling the N Monomoy estimate might be more indicative of number of shorebirds we would find on the entire refuge on that date.

Of additional interest to us has been observing shorebirds on southbound migration later in the summer also feeding on horseshoe crab eggs. The long bills if godwit species, both Hudsonian and Marbled exhibit the most visual evidence of this behavior when they stand in one location for minutes at a time probing repeatedly in "sowing machine" style in saturated sediments. Photos of this are also included in this letter. The following list is species of birds we observed feeding on horseshoe crab eggs in 1) spring migration, and 2) southbound or fall migration.

1) <u>Spring 2022-2023 Observations</u>
   Red Knot
   Ruddy Turnstone
   Dunlin
   Sanderling
   Semipalmated Sandpiper
   Short-billed Dowitcher
   Pintail
   Black Duck
   Mallard
   Bonaparte's Gull
   Ring-billed Gull
   Laughing Gull

2) <u>Fall observations 2015-2022</u>
   Hudsonian Godwit
   Marbled Godwit
   Bar-tailed Godwit
   Short-billed Dowitcher
   Ruddy Turnstone
   Sanderling
   Semipalmated Sandpiper



Image 1. Ruddy Turnstones feeding on horseshoe crab eggs buried in an exposed sandbar on North Monomoy Island, Barnstable County, Massachusetts, May 23, 2023. Photo by Brad winn, Manomet.



Image 2. Horseshoe crab egg chambers excavated by Ruddy Turnstones on North Monomoy Island, Barnstable MA. Photo by Brad Winn, Manomet, May 23, 2023.



Image 3. Horseshoe crab egg chamber excavated by Ruddy Turnstones on North Monomoy Island, Barnstable MA. Photo by Brad Winn, Manomet, May 23, 2023.



Image 4. Horseshoe crab spawning site on an embryonic dune on North Monomoy Island, Barnstable County MA. Some egg chambers excavated by staging Ruddy Turnstones on migration to Arctic nesting areas. Photo by Brad Winn, Manomet, May 23, 2023.



Image 5. Horseshoe crab egg chamber excavated by Ruddy Turnstones on North Monomoy Island, Barnstable MA. Photo by Brad Winn, Manomet, May 23, 2023.



Image 6. Part of our 265 Red Knot estimate on North Monomoy. Photo by Brad Winn, Manomet, May23 2023.

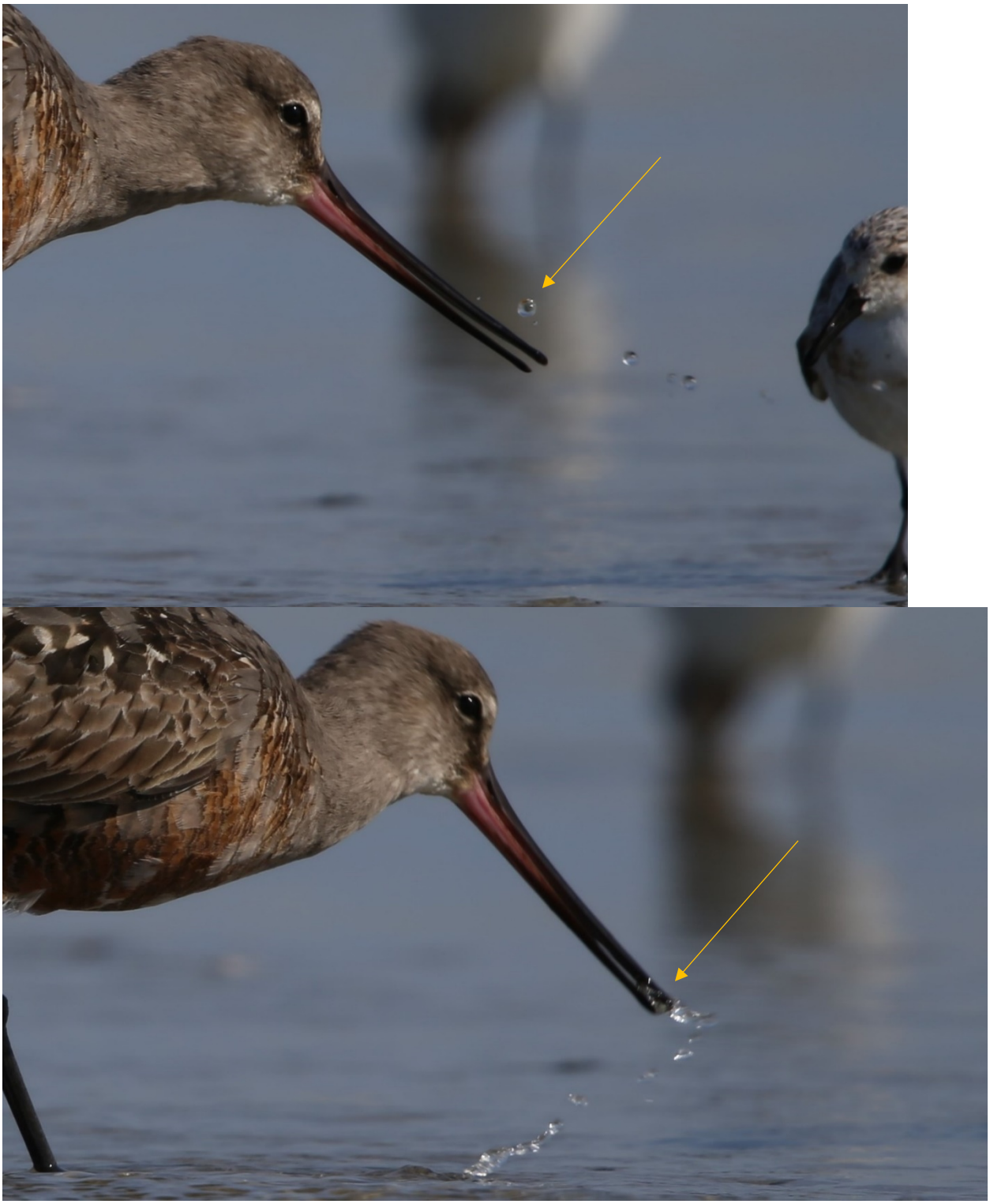


Image 7. Red Knot, Short-billed Dowitcher, Sanderling, Eastern Willet, Semipalmated Sandpiper, and Laughing Gull, exhibiting feeding behavior consistent with a horseshoe crab spawning location on an intertidal bar, Monomoy NWR. Photo by Brad Winn, Manomet, July 20, 2018.





Images 8 and 9. Hudsonian Godwit (*Limosa haemastica*) post-breeding migration stopover, feeding on horseshoe crab eggs with an attendant Sanderling, Monomoy NWR, Cape Cod MA. Photo by Brad Winn, Manomet, August 5, 2018. Egg visible mid-mandible in both photos.



Images 10 and 11. Hudsonian Godwit (*Limosa haemastica*) post-breeding migration stopover, feeding on horseshoe crab eggs, Monomoy NWR, Cape Cod MA. Photos by Brad Winn, Manomet, August 17, 2017. Egg visible in air above bill in first photo and two eggs in bill tip in second photo.



Images 12 and 13. Hudsonian Godwit (*Limosa haemastica*) post-breeding migration stopover, feeding on horseshoe crab eggs, Monomoy NWR, Cape Cod MA. Photos by Brad Winn, Manomet, August 17, 2017. Egg visible near bill tip in first photo and three eggs cradled in mandible prior to ingestion in second photo. Godwit had persistent sanderlings and/or Ruddy Turnstones as kleptoparasites, gleaning or stealing HSC eggs extracted by the godwit.

In summary, Manomet shorebird staff are in the preliminary stages of a broader study involving food resources for shorebirds in eastern Massachusetts, with the shorebird use of horseshoe crab eggs, fiddler crabs for Whimbrel, and ongoing eDNA analysis of Red Knot foods, as our current focal research. We intend to elevate and broaden our understanding of horseshoe crabs and their eggs as food resources for shorebirds in Massachusetts.

From what we have observed and photographed; we believe that horseshoe crab eggs are an important food resource for migrating shorebirds during their northbound stopover period in May and early June, and during the southbound stopover in July and August. We think that restoring horseshoe crab populations throughout eastern Massachusetts in both geographic scope and overall population levels is a prudent and risk averse measure to help improve the survival of rapidly declining Atlantic Flyway shorebirds populations dependent on our shores. Thank you for your consideration.

Sincerely,



Brad Winn
Vice President, Resilient Habitats

CC:
Alan Kneidel
Liana DiNunzio
Tim Simmons
Mark Faherty
Stephanie Koch
Eileen McGourty
John Herbert

Exhibit I

Introduction
Identification
Plumages, Molts, and Age Criteria
Systematics
Distribution
Habitat
Movements and Migration
Dispersal and Site Fidelity
Migration Routes and Timing
Migration Behavior
Migration Mortality
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Movements and Migration

Dispersal and Site Fidelity

Natal Philopatry

Little is known about the journey which a juvenile Red Knot makes from its natal area to its first wintering area. Juveniles are known to migrate south in the autumn, but the timing of this movement is poorly documented. Juveniles have been recorded in Delaware Bay from late July to early October (Clark et al. 1993, Dey et al. 2011), but the majority of juveniles are not recorded in Delaware Bay until mid-September (Clark et al. 1993, Dey et al. 2011). Juveniles have been recorded in the Bay of Fundy from late July to early October (Hicklin and Gratto 1983, Hicklin 1987), but the majority of juveniles are not recorded in the Bay of Fundy until mid-September (Hicklin and Gratto 1983, Hicklin 1987). Juveniles have been recorded in Virginia from late July to early October (Watts et al. 2010), but the majority of juveniles are not recorded in Virginia until mid-September (Watts et al. 2010). Juveniles have been recorded in South Carolina from late July to early October (Dey et al. 2011), but the majority of juveniles are not recorded in South Carolina until mid-September (Dey et al. 2011). Juveniles have been recorded in Florida from late July to early October (Dey et al. 2011), but the majority of juveniles are not recorded in Florida until mid-September (Dey et al. 2011). Juveniles have been recorded in Texas from late July to early October (Dey et al. 2011), but the majority of juveniles are not recorded in Texas until mid-September (Dey et al. 2011). Juveniles have been recorded in Mexico from late July to early October (Dey et al. 2011), but the majority of juveniles are not recorded in Mexico until mid-September (Dey et al. 2011). Juveniles have been recorded in Central America from late July to early October (Dey et al. 2011), but the majority of juveniles are not recorded in Central America until mid-September (Dey et al. 2011). Juveniles have been recorded in South America from late July to early October (Dey et al. 2011), but the majority of juveniles are not recorded in South America until mid-September (Dey et al. 2011).

Migration Routes and Timing

Long-distance migrant (■), with relatively few exposure sites, in the Western Hemisphere, populations breed in the Arctic, and migrate to wintering latitudes in the eastern Pacific and Atlantic oceans, as well as in the interior of south temperate latitudes, including southernmost continental lands of South America and eastern Europe. Migration routes (■) and timing (■) are shown for the Red Knot (Calidris canutus) in the Western Hemisphere. Migration routes and timing

before twilight. However, in San Antonio Oeste, Argentina, birds often depart under cloudy conditions, taking advantage of tailwind assistance from cool southern fronts that condense moisture and clouds when moving against the warmer air masses in the north (PMG). Knots emit a distinctive call when making short local flights before and at departure time (see Sounds). Flock configurations may vary (in order of prevalence at Banc d'Arguin, Mauritania) from V-formations to echelons, clusters, or bunches.

Flock size tends to differ among species. Red Knots tend to have larger migratory flocks than most other shorebirds; mean size of 64 flocks departing north from Mauritania was 29 ±28 SD, with the "average bird" being in a flock of 56 ±31 birds. Mean size of flocks departing the Dutch Waddenzee during spring was 92 ±100 (the average bird was in a flock of 197 ±110); during fall, comparable values on the Waddenzee were 113 ±121 SD and 236 ±108, respectively. Directions taken by departing flocks seem to be on a near-direct course toward their destination, with little allowance for wind drift, possibly excepting conditions when departures take place with tailwinds. Departing flocks observed in Mauritania gained altitude at rate of 0.91 m/s, a relatively higher value than for 7 other species measured (Piersma et al. Piersma et al. 1990a, Piersma et al. 1990b, see also Piersma et al. 1997,Tulp et al. 1994 and Battley 1997.

At Delaware Bay, northward-departing Red Knot flocks typically start out as clusters, sometimes of mixed species, but with increasing altitude change to V-formations and echelons, with species tending to segregate (BAH). Generally fly on a northwesterly track, but often deviate—especially toward the southwest or south—as long as flocks are in sight. Long distance migrants try to optimize their energy, time and water budget during migration and avoid wind drift by selecting tail-wind assistance and choosing optimal altitudes (Liechti 2006). Knots can fly thousands of kilometers nonstop in several days, but they cannot predict weather conditions further in their route. In 2010 the geolocator bird 1VL flew 6,800 km in 6 d from Cape Cod to Maranhão in n. Brazil, which included a 1,000 km northeast detour to avoid head winds. Y0U, another geolocator knot, skipped the storm Danny by flying 4,000 km around it for a great circle distance of 2,970 km, and then stopped 7 d in the Lesser Antilles until after the storm Erika and completed its passage (Niles et al 2010). Knots in poorer condition flying north from tropical non-breeding areas in Mauritania to the German Wadden Sea can stop in alternative wetlands in France in years with unpredictable head winds (Shamoun-Baranes et al. 2010).

Control and Physiology of Migration

Harrington et al. (Harrington et al. 1986a) and Gudmundsson et al. (Gudmundsson et al. 1991) showed that knots about to depart on long migration flights have mean body masses 50–55% greater than estimated fat-free mass. With an average mass ranging from 111 g at arrival and 200 g at departure, Red Knots have one of the highest rates of mass gain in vertebrates, up to 5-7 times the basic metabolic rate (Gillings et al 2009, Atkinson et al 2007, Kvist and Lindström 2003). However, with a mean daily increase of 3.1 g, or about 2.3% of the lean body mass, these rates of mass-change may differ substantially during migration stopovers. In March in San Antonio Oeste in Argentina, during the long period of heavy alternate body molt with high protein and lipid contents in blood, the average rate of mass gain is only 0.6 g/d. Further north in Lagoa do Peixe in s. Brazil, Red Knots gain an average of 3.1 g/d before departing on long distance flights in late April (Piersma et al 2005, D'Amico et al 2010).

In contrast, knots refueling in Delaware Bay in May can gain mass at up to 7.2 g/d in 11-12 d (Gillings et al 2009), reaching higher body masses than needed for migration – extra "fuel" that allows for survival and attainment of breeding condition under unpredictable (and often extreme) conditions after arrival on arctic breeding grounds (Baker et al 2004, Morrison et al. 2005). These rates of mass gain are dependent both on date and mass at initial capture; rates are two to three times lower in knots arriving early (mid-May) than in late-arriving individuals (late May) with similar initial mass; they have to fuel more quickly because they need to arrive in the Arctic in time for the short breeding season (Drent 2003). Mass gain rates are also lower in fat birds than in thinner ones (Atkinson et al 2007).

Prior to migration, knots undergo pronounced changes in basal metabolic rates, organ sizes, muscle masses and fat mass, along with overall increase of mass (Piersma et al. 1995a). The increase of mass, once thought entirely attributable to increased fat, includes shifts in the relative sizes of different muscle masses (e.g., leg muscle mass decreases, flight muscle mass increases) and organs (e.g. stomach, proventricular gizzard and intestine masses decrease), as well as increased fat. In migrants, heart and hematocrit increase as well, probably for fast refueling and to provide more oxygen to tissues during the hard exercise of flight in thinner air layers (Piersma et al. 1999b).

In their long distance flights, shorebirds not only burn fat stores but also use proteins from muscle tissues and digestive organs (Battley et al. 2000). Proteins are important in the blood transportation of fatty acids from the adipose tissues to the working muscles and in providing endogenous water from their own catabolism (Williams et al. 2004, Gerson and Guglielmo 2011). In Delaware Bay, body mass composition after arrival consists of 85% lean mass in knots < 133 g, but once this break-point is reached, mass increase is 84% fat (Atkinson et al 2007). Rates of mass gain are lower in tropical environments where birds have lower thermoregulatory and maintenance costs than in temperate habitats. Because it takes some time to rebuild organs of the digestive system after arrival and because of the low quality of available prey, it seems advantageous for Tierra de Fuego knots to avoid stopping in tropical areas like Maranhão in n. Brazil during northward migration, when their time budget is constrained (Piersma 2007, Van Gils et al 2005).

‹ Habitat

Diet and Foraging ›

Recommended Citation

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Exhibit J

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RESEARCH ARTICLE

WILEY

Horseshoe crab egg availability for shorebirds in Delaware Bay: Dramatic reduction after unregulated horseshoe crab harvest and limited recovery after 20 years of management

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Abstract

1. The largest aggregation of spawning American horseshoe crabs in the world occurs in Delaware Bay and supports one of the largest concentrations of shorebirds in the western hemisphere where the birds feed on horseshoe crab eggs during migration. Unregulated harvest in the 1990s is associated with the decline of shorebird populations using the bay, but corresponding baseline information on the horseshoe crab egg food supply that supported peak shorebird populations has been lacking.
2. Past and current measurements of horseshoe crab eggs in the bay indicate that abundance in the 1980s was an order of magnitude greater ($\bar{x}$ = 156,600/m^2) than present-day estimates (2015–2021 $\bar{x}$ = 10,243/m^2). An additional egg prevalence index, which characterizes the timing and magnitude of horseshoe crab egg output, revealed a similar pattern of higher prevalence in the 1980s (0.89, 95% confidence interval 0.81–0.94) compared with the recent 2015–2021 interval (0.52, 95% confidence interval 0.43–0.60).
3. Declines of egg and shorebird abundance occurred shortly after horseshoe crab harvest reached its peak. Red knot aerial survey counts have stabilized at 30% of the baseline population while ruddy turnstone counts are 40% of baseline estimates. Initially these species were evenly distributed between the New Jersey and Delaware coasts but both species have trended toward predominately occupying New Jersey beaches.
4. A lack of recovery of horseshoe crab egg and shorebird abundance suggests that horseshoe crab harvest management has stabilized populations but progress toward population recovery has been limited. Impacts from bycatch, the pharmaceutical industry and other potential population impacts must be better quantified and mitigated, if necessary, to promote the recovery of horseshoe crab populations. Measurements of horseshoe egg prevalence and abundance are essential metrics for tracking the progress toward management goals for improving shorebird habitat quality.

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KEYWORDS

Arenaria interpres, *Calidris canutus rufa*, harvest management, horseshoe crabs, *Limulus polyphemus*, pulsed resource, red knot, ruddy turnstone, shorebirds

1 | INTRODUCTION

One of the most renowned and well-documented convergences of migratory animals with a seasonally pulsed resource (Holt, 2008; Bauer & Hoye, 2014) are Arctic-nesting shorebirds and spawning American horseshoe crabs (*Limulus polyphemus*) in Delaware Bay (Dunne et al., 1982). This phenomenon is reminiscent of spawning salmon (Bailey & Moore, 2020) and herring on the Pacific coast of North America where a massive marine subsidy is delivered to terrestrial and littoral ecosystems. Herring produce a concentrated pulse of eggs (>1 million eggs/m^2) in intertidal areas that are exploited by a wide variety of predators (Willson & Womble, 2006) from harbour seals to sea ducks (Lewis, Esler & Boyd, 2007). Likewise, horseshoe crab eggs, larvae and early life stages are consumed by a wide variety of terrestrial and aquatic predators in the nearshore environment (DeSylva, Kalber & Shuster, 1962; Botton, 2009). Subsequent work has revealed that shorebirds historically (Cramer, 2015) and currently exploit horseshoe crab eggs wherever horseshoe crabs spawn on the eastern seaboard (Smith et al., 2019; Takahashi, Sanders & Jodice, 2021), but there is no larger aggregation of spawning horseshoe crabs and shorebirds than the Delaware Bay coast of Delaware and New Jersey (Shuster & Botton, 1985).

The integrity of this wildlife spectacle (Myers, 1986) was threatened in the 1990s when a surge of unregulated harvest of spawning horseshoe crabs proceeded unabated for nearly 10 years as a new market emerged for this species (Millard et al., 2015). Harvests during this period peaked at 10 times the background harvest rate that had occurred for the previous 4 decades (Kirkley, 2009). A baseline for shorebird abundance prior to the period of unregulated horseshoe crab harvest is well-documented, with peak single-day counts of more than 200,000 shorebirds along 160 km of shoreline (Dunne et al., 1982; Clark, Niles & Burger, 1993). Studies confirmed that horseshoe crab eggs are the dominant dietary component of numerous shorebird species during spring stopover on Delaware Bay (Tsipoura & Burger, 1999). Counts that continue to the present have documented a dramatic decline in the abundance of shorebirds, particularly red knot (*Calidris canutus*) (Baker et al., 2004; Niles et al., 2009). This decline was confirmed at major wintering sites in Tierra del Fuego where red knot populations have fallen to 10–20% of their baseline abundances documented during surveys carried out in the 1980s (Morrison, Ross & Niles, 2004). The red knot was subsequently listed under the U.S. Endangered Species Act (U.S. Fish and Wildlife Service, NJ Field Office, 2021).

During the period of unregulated horseshoe crab harvest in the 1990s, truckloads of spawning adults were serially removed from spawning beaches for use as bait in the commercial fishing of eel and whelk (Kreamer & Michels, 2009). With horseshoe crabs taking more than a decade to reach reproductive maturity (Shuster & Sekiguchi, 2003), such targeting of dense concentrations of reproductively mature individuals on a recurrent basis had a high likelihood of resulting in population-level impacts and a weakening of the strength and magnitude of the resource pulse generated by horseshoe crab eggs. Concern for the conservation of shorebird populations triggered the initiation of regulations which controlled the harvest of horseshoe crabs for bait (Berkson & Shuster, 1999). Considerable effort and innovation have been applied by management agencies to design a management model that makes harvest limit determinations based on both horseshoe crab and red knot population indices (McGowan et al., 2011). However, more than 20 years hence, the recent horseshoe crab stock assessment concluded that the Delaware Bay spawning population has not substantially increased above 1998 levels during peak harvest rates shortly before the first management regulations were implemented (Atlantic States Marine Fisheries Commission, 2019). This raises the question of whether current policies are adequate to support the recovery of horseshoe crab and shorebird populations (Niles et al., 2009).

A key limitation in assessing the effectiveness of management has been uncertainty in setting a baseline regarding the size and demographic characteristics of the horseshoe crab population prior to the wave of unregulated harvest. Horseshoe crab spawning surveys and population indices from various agency-led fisheries sampling efforts were only initiated after the peak of overharvest (Atlantic States Marine Fisheries Commission, 2019). In lieu of a baseline prior to unregulated harvest, the 1998 population index is used as a reference for assessing the trajectory of the present-day population (Atlantic States Marine Fisheries Commission, 2019), the point when regulation was first enacted to control the harvest and presumably when horseshoe crab populations were most reduced by the previous decade of exploitation.

To establish additional pre-exploitation baseline conditions of the Delaware Bay ecosystem, this study analyses a previously unpublished dataset of horseshoe crab egg abundance collected in the 1980s when shorebird populations were still at peak documented levels and prior to the wave of unregulated overharvesting that occurred afterwards. This 3-year dataset provides essential baseline information on the magnitude of the egg supply available to shorebirds at that time. Results from this work are contrasted with abundances reported by previously published studies along with a 21-year record of horseshoe crab egg sampling in New Jersey. Taken together, these datasets illustrate how horseshoe crab egg abundance has varied over time and according to water temperature. In addition, this study investigates the correspondence between horseshoe crab egg abundance and a long-term dataset of shorebird population size and distribution in Delaware Bay.

2 | METHODS

2.1 | Study sites

Horseshoe crab surface egg abundance was measured at 16 beach segments (Figure 1) along 60 km of shoreline on the New Jersey side

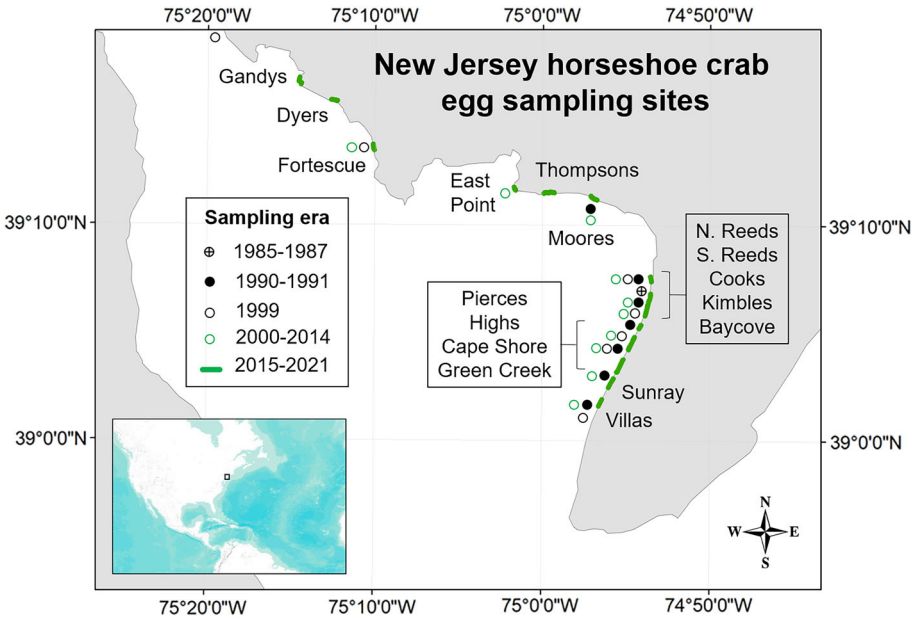


FIGURE 1 Horseshoe crab egg sampling sites along New Jersey Delaware Bay beaches during different periods. Original data from 1985–1987, 2000–2011 and 2015–2021 are presented in this paper. 1999 (Pooler et al., 2003) and 1990–1991 data (Botton, Loveland & Jacobsen, 1994) are from previously published studies.

of Delaware Bay: Villas (39° 1′ 41.8″, −74° 56′ 33.62″), Sunray Beach (39° 2′ 48.1″, −74° 55′ 48.39″), Green Creek (39° 3′ 27.71″, −74° 55′ 21.22″), Cape Shore Lab (39° 4′ 20.41″, −74° 54′ 47.58″), Highs Beach (39° 4′ 45.44″, −74° 54′ 32.43″), Pierces Point (39.088622, −74.902357), Baycove (39° 6′ 5.54″, −74° 53′ 45.4″), Kimbles (39.104981, −74.894787), Cooks (39.108768, −74.893400), South Reeds (39.113397, −74.892138), North Reeds Beach (39° 7′ 34.12″, −74° 53′ 30.42″), Moores Beaches (39.188528, −74.949769), Thompsons Beaches (39.192391, −74.995136), Fortescue (39.224410, −75.167431), Dyers Cove (39.263407, −75.208092) and Gandys Beach (39° 16′ 45.78″, −75° 14′ 33.25″). These ranged in character from 'optimal' to 'suitable' in terminology proposed by Botton, Loveland & Jacobsen (1988) and as mapped by Lathrop et al. (2013).

2.2 | Surface egg abundance 2015–2021

Sampling for surface egg abundance occurred along 9-m cross-shore transects centred mid-slope on the beach profile. Transects were systematically distributed along the beach, with five to 10 transects per beach (45–90 core samples) depending on beach size. To minimize repeated disturbance of the same sampling sites during subsequent sampling events, the sampling transect was placed at a random offset within 25 m of the initial transect location. Monitoring occurred across 96 transects in 2015–21. To estimate horseshoe crab egg availability for shorebird feeding, shallow-depth horseshoe crab egg densities were sampled for 6 weeks starting in the first week of May (ranging from 4 May to 11 June). Each beach was sampled once per week from 2015–2018 (six sampling events per site, n ∼ 5,000 samples per year) and every other week in 2019–2021 (three sampling events per site, n ∼ 2,500 samples per year).

Sediment cores were taken at 1-m intervals along the transect centred on the middle of the beach slope (nine cores per transect). Sediment cores were 5 cm deep with a 5.7 cm diameter (255.17cm^3), similar to previous studies (Pooler et al., 2003). At each sampling location, depth of sand to underlying peat was recorded as a measure of horseshoe crab spawning habitat quality (Smith et al., 2020). Depths were classified into binary classes (>40 or <40 cm deep) and the percentage of samples in each class by site and over time. Although egg clusters are typically deposited at depths of 20 cm or less, added sand depth below this helps buffer egg clusters from anoxic conditions associated with underlying peat (Botton, Loveland & Jacobsen, 1988).

Cored sand samples were stored in polyethylene bags. Samples were processed by placing the sample in a shallow tray and adding a small amount of fresh water to create a thin layer of water in the bottom of the tray. A gentle shake of the tray causes eggs to settle above the veneer of sand. Eggs then were tallied with a click counter under a magnifying lamp.

2.3 | Surface egg abundance 2000–2014

Seasonal survey timing (mean start and end dates: 4 May to 11 June), sediment coring and counting methodology were similar to the methods described above. The key difference during this interval is that sampling occurred within a discrete 100 m stretch of beach, samples were collected across a 15-m width of beach profile (instead of 9 m) and 100 core samples were aggregated for counting within each 3 m wide profile intervals to yield five samples per beach and sampling occasion. This totalled 3,198 samples over 15 years.

2.4 | Surface egg abundance 1985–1987

Shallow-depth horseshoe crab egg abundance was measured every 2–5 days between 20 April and 14 June 1985–1987 at South Reeds

Beach by taking 5 cm deep, 5 cm diameter sediment cores (2.4 cm diameter in 1985). Sampling occurred on three occasions in 1985 (n = 36 core samples per occasion), 12 in 1986 (n = 42 core samples per occasion) and eight in 1987 (n = 42 core samples per occasion). Three samples were taken within successive 1 m wide zones along a cross-shore transect established near the southern terminus of the beach from the spring tide line to the bottom of the beach profile. Core samples were washed and screened to separate horseshoe crab eggs from the sand. The separated eggs were then transferred to a graduated cylinder, with volume of eggs recorded to the nearest 0.1 ml.

To convert egg volume to estimated counts, volume was multiplied by 0.634 to account for the volume of airspace between eggs when packed in the graduated cylinder. This coefficient represents the maximum theoretical packing density of spheres in a confined space (Song, Wang & Makse, 2008). This volume was then divided by the average volume of a single horseshoe crab egg. Undeveloped eggs are 1.7 mm in diameter on average (Shuster & Sekiguchi, 2003) whereas the maximum size of eggs prior to the development of a transparent chorion is 1.98 mm (Shuster & Sekiguchi, 2003). Abundance conversions were calculated for both sizes, yielding an abundance/ml conversion of 157 eggs at 1.7 mm diameter and 248 eggs at 1.98 mm diameter. This range is similar to that found in previous studies in Delaware Bay where measurements of eggs per ml (at unknown stages of development) were reported: 178 eggs/ml (Weber, 2002) and 144–209 eggs/ml (Shuster & Botton, 1985).

Analysis of presence/absence of at least one egg in a sample (egg prevalence) was based on data from 42 individual cores samples per sample occasion from 1986 (n = 504) and 1987 (n = 336). For egg volume, we used summary data (egg volume by beach profile zones) so that sample size per sampling event was n = 12 for 1985, n = 14 for 1986 and n = 7 for 1987.

2.5 | Previously published studies

Using the Web Plot Digitizer, horseshoe crab egg density data were extracted from figures (Rohatgi, 2015) that appear in Botton, Loveland & Jacobsen (1994). These data reflect egg density in the 0–5 cm beach strata during 10 sampling occasions in 1990 and 1991 between 17 April and 11 June. One site, Higbees Beach, was excluded because it was never sampled in subsequent studies and had very low horseshoe crab spawning activity. Data presented by Pooler et al. (2003) for egg abundances in the 0–5 cm strata across eight New Jersey Beaches (Figure 1) during two sampling occasions (25–26 May and 14–15 June) are also summarized here.

2.6 | Horseshoe crab egg prevalence

A complementary measure of horseshoe crab egg availability is prevalence (the proportion of samples with at least one egg present). This metric can help characterize the timing and magnitude of the resource pulse over the course of a season by extracting logistic regression model parameters in a time vs prevalence relationship. In addition, the prevalence metric can also help verify patterns observed in count data where different eras of sampling used slightly different methodologies for sampling and enumeration of eggs.

2.7 | Analyses of egg abundance and prevalence

For analyses of egg abundance, zero-inflated negative binomial mixed models were implemented via the glmmTMB package in program R (Brooks et al., 2017) to estimate surface egg abundance over the course of each season using a year and Julian date interaction term for both the negative binomial count model as well as the zero-inflated (presence–absence) model component. A square or cubic spline was included as part of the date term to allow for variable slopes and peaks of egg abundance over the course of a season that can occur due to variation in water temperature and peaks of spawning around the full and new moon. Site was included as a random effect.

For comparisons between earlier phases of egg sampling (1985–87 and 1990–91) with the most recent phase (2015–2021), we constrained the most recent data to sampling sites that were common between the two periods (one site for 1985–87 and six sites for 1990–91). We also include habitat quality (beach sand depth) as a random effect to account for changes to habitat quality from early to recent periods. We assumed uniform high habitat quality for early periods (Loveland & Botton, 2015) and for the 2015–21 phase used site-level seasonal averages of proportion of sampling locations with sand depths >40 cm.

For analyses of egg prevalence (presence of at least one egg in a sample), binomial mixed models via the glmmTMB package in program R were used to estimate surface egg prevalence over the course of each season using a year and date interaction term with site as a random effect. The date of peak acceleration in prevalence, a proxy metric for the onset of widespread horseshoe crab spawning, was extracted from the modelled relationship of prevalence over time for each year. A separate analysis that included satellite-derived water temperature data was implemented to understand how prevalence varies in relation to water temperature during progressive phases of the spawning period. The ggeffects (Lüdecke, 2018) package was used to generate and plot model predictions, emmeans (Lenth et al., 2018) package to estimate contrasts between levels of categorical variables and the DHARMa package (Hartig, 2019) to generate diagnostic plots and evaluate model fit.

2.8 | Shorebird abundance

The Delaware Bay Aerial Shorebird Survey has been carried out from 1986 to the present by the New Jersey Department of Environmental Protection's Nongame and Endangered Species Program (Clark, Niles

& Burger, 1993). Methods are described in detail in Clark, Niles & Burger (1993) but in short, the survey includes the Delaware and New Jersey shorelines of the bay where counts of shorebirds including red knot, ruddy turnstone (*Arenaria interpres*), sanderling (*Calidris alba*) and semi-palmated sandpiper (*Calidris pusilla*) occur at high tide from fixed-wing aircraft flown and low altitude (25 m) and slow speed (110 km/hr). Counts occur on multiple occasions within a season to capture the peak of the shorebird stopover period. Peak values and patterns of distribution were examined based on at least two aerial survey flights for each year from the shorebird survey for red knot and ruddy turnstone, the two species that have been counted consistently over the entire long-term study. Compared with population estimates based on mark-resight methodology, aerial counts underestimate the snapshot mark-resight-derived population size by approximately 17% (Lyons, 2014, 2015, 2016, 2017, 2018, 2019, 2020). To identify abrupt shifts in count totals over time, we use the mcp package (Lindeløv, 2020) in program R to detect the presence of changepoints in the intercept of a linear model of shorebird abundance over time.

Counts are tallied within 81 zones that stretch from Cape May to the Cohansey River on the NJ shore and from Cape Henlopen to Woodland Beach on the DE shore. Data were aggregated into three zones to examine trends in shorebird distribution around the bay over time. These were the NJ shore (88 km), the DE shore excluding Mispillion Harbour (73 km) and Mispillion Harbour (2 km). Mispillion Harbour was held separately because of the consistent high concentration of horseshoe crabs and shorebirds observed there (Karpanty et al., 2006). We then calculated the proportion of the total red knot and ruddy turnstone count per season that occurred in each zone and used linear regression with a spline term to characterize any non-linear trends in the time series. The mcp package (Lindeløv, 2020) in program R was used to detect changepoints in the intercept of a linear model of the proportion of shorebirds counted per zone over time.

2.9 | Satellite-derived water temperature

Spring water temperatures must reach a threshold that triggers widespread horseshoe crab spawning. The exact value of this threshold is unclear but it is believed to be ≈15°C (Thatcher, 2020). Satellite-derived sea surface temperature (SST) products from the AVHRR and MODIS satellites were used to examine how egg prevalence varies within and between seasons due to water temperature (which mediates the timing of spawning). For years prior to 2006, we used 0.1 degree spatial resolution, 8-day summary SST data from the AVHRR Pathfinder satellite (Saha et al., 2018). For the 2015–2021 time frame we used 0.1° resolution, 8-day summary SST data from the MODIS/AQUA satellite (Kilpatrick et al., 2015). Data were downloaded for five 8-day intervals between 23 April and 1 June. Because individual data cells have varying data availability across intervals due to cloud cover, data were extracted from a range of cells representing the study area and each cell was assigned an ID that was used as a random effect in a γ-distributed linear mixed model. For the AVHRR satellite, data were not available within Delaware Bay itself. In this case we extracted temperature from a 5,400-km^2 region at the mouth of the bay (Figure S1). For the MODIS satellite we extracted data from this area along with a 485-km^2 region just offshore of study beaches within Delaware Bay (Figure S1).

3 | RESULTS

3.1 | Surface egg abundance

Egg abundance in the top 5 cm of sand on the New Jersey side of Delaware Bay in the 1980s was more than 10 times that of present-day estimates. Estimates from 2015 to 2021 average 10,243 eggs/m^2 and ranged from 4,856 to 18,553/m^2 (Figure 2, Table S1). Converting egg volume/sample measurements from the 1980s to a comparable eggs/m^2 metric yields an estimate of 247,423 eggs/m^2 (95% confidence interval (CI) 159,034–384,936) when using a 1.7-mm egg diameter conversion factor (representing the size of a freshly deposited egg). Increasing egg size to the equivalent of an egg in late-stage development (1.98 mm) produces an estimate of $\bar{x}$ = 156,600 eggs/m^2 (101,116–242,528). The two estimates represent boundaries on the true count given that eggs at varying stages of development occur in samples. Across the 3 years, egg abundance in 1985 was significantly greater than 1986 (P = 0.0003) and 1987 (P < 0.001, Figure 2, Table S2). Egg abundance in 1986 and 1987 did not differ significantly (P = 0.13). Egg abundance estimates for 1985–87 derived from both 1.7- and 1.98-mm egg sizes were significantly greater than estimates for the current sampling period at South Reeds Beach (2015–2021, P < 0.0001, Table S3) where sampling in the 1980s occurred.

Data from 1990–1991 (Botton, Loveland & Jacobsen, 1994) appear to show an intermediate level of horseshoe crab egg abundance, with an overall estimate of 49,782 egg/m^2 (95% CI 20,516–120,796) at mid-beach (corresponding with the 9-m zone sampled in 2015–2021) based on five sampling bouts between late April and mid-June over 2 years (Figure 2). In 1990, mid-beach egg abundance peaked in early June at 22,693 eggs/m^2 (95% CI 6,637–77,585, Table S4), although an earlier peak may have been missed due to a lack of sampling in mid-May that year. A single sampling campaign across six beaches the following year in mid-May measured a mean horseshoe crab egg abundance at mid-beach of 74,480/m^2 (95% CI 22,500–246,539, Table S4). Horseshoe crab egg abundance in 1990–91 overall was significantly greater (P = 0.002, Table S5) than during the most recent 7 years of sampling (2015–2021) after controlling for site, habitat quality and sampling position on the beach profile.

There is a gap in horseshoe crab egg sampling corresponding with the ramp-up and peak of horseshoe crab overharvest (Figure 2), but when egg sampling resumed in 1999 (Pooler et al., 2003), surface egg abundance was considerably lower (25–26 May, NJ sites $\bar{x}$ = 4,621/m^2, Figure 2; DE sites $\bar{x}$ = 3,947/m^2) than the prior data from 1985–87

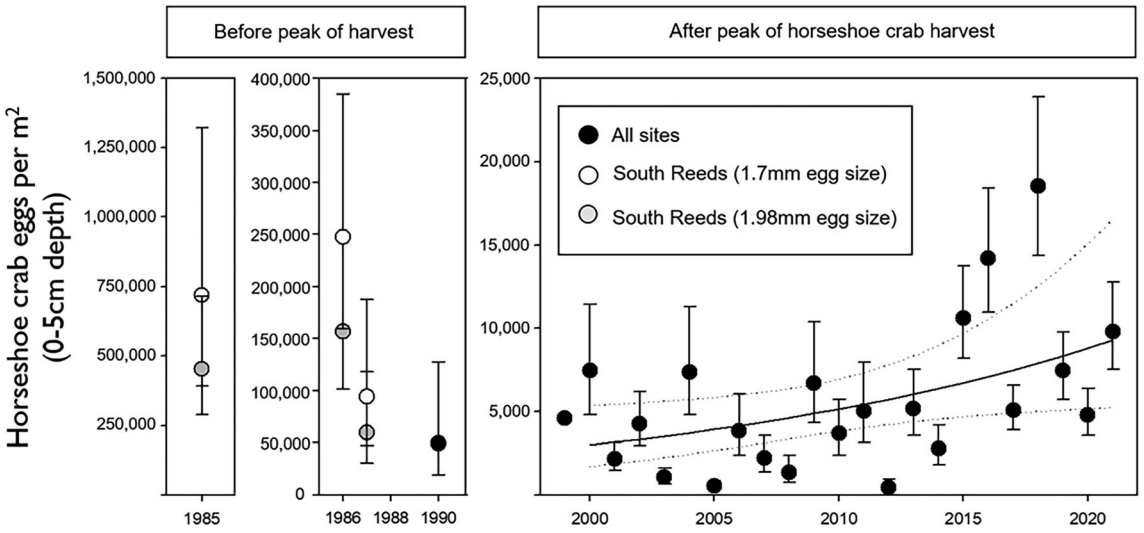


FIGURE 2 Estimates of horseshoe crab egg abundance in the top 5 cm of sand at baseline (1985–1990) and after sustained uncontrolled harvest of horseshoe crabs (1999–2021). Abundance data from South Reeds Beach are derived from egg volume conversions. The 1.7-mm size corresponds with the average size of a freshly deposited egg while the 1.98-mm corresponds with the size of an egg near its maximum size during late development. Egg abundance estimates for 1990 are from Botton, Loveland & Jacobsen (1994) and 1999 estimates are from Pooler et al. (2003).

and 1990–1991. Estimated mean surface egg abundance on 25 May between 2000 and 2014 (Table S6) ranged from 872 (in 2003) to 16,370 (in 2012) with an average of 3,961 eggs per m^2 (95% CI 2,636–5,952). Data across the last 22 years (2000–2021) show a modest increasing trend over time based on annual point estimates of egg abundance on 25 May ($R^2 = 0.24$, $P = 0.04$), but this increase does not approach the levels observed during the 1985–1991 time period (Figure 2). A projection of this trend line indicates that surface eggs would not approach 1980s baseline abundances (e.g. 100,000/m^2) until 2065.

3.2 | Shorebird abundance

The drastic decrease in horseshoe crab egg abundance measured on NJ Delaware Bay beaches corresponds with an equally drastic decline in shorebird populations using the bay, particularly red knot and ruddy turnstone (Figure 3). A changepoint analysis to detect a change in the intercept of the linear abundance trend over time (Lindeløv, 2020) identified a changepoint in 2002 (2000–2004 95% CI) for red knot where the mean peak aerial count dropped from 43,221 (36,537–50,208 95% CI) to 15,707 (3,569–26,909 95% CI). A similar changepoint occurred in 2003 for ruddy turnstone (2001–2005 95% CI) when the mean peak count dropped from 70,109 birds (61,236–78,427 95% CI) to 28,625 (13,041–43,700 95% CI). The period during which changepoints were identified corresponds with a known decline in survival and recruitment of red knots using the Delaware Bay stopover site between 2000–2003 (Baker et al., 2004) as well as the decline in surface egg abundance described above.

As shorebirds declined, they changed patterns of distribution in Delaware Bay, with a shift away from DE and towards NJ. Red knot occupancy of Delaware beaches showed a significant negative trend over the time series (Figure 3, Nagelkerke's $R^2 = 0.58$, $P < 0.0001$) with changepoint analysis indicating this trend beginning in 1998 (1996–2000 95% CI, Figure 3). In the 12 years prior to this changepoint a mean of 36% of all red knots counted occurred along the 73-km Delaware coast (excluding Mispillion Harbour). This has declined to <5% over the most recent 5 years of surveys (2015–2019). At Mispillion harbour, there has been no significant trend ($R^2 = 0.02$, $P = 0.41$), within this 2-km stretch of shoreline which holds an average of 22% of red knots counted during 1984–2019 time series.

The trend along New Jersey's coastline has been the opposite of Delaware, with an average of 83% of all red knots counted now occurring in this zone over the recent 2015–2019 survey interval. Before the trend away from Delaware began (1986–1997), a mean of 45% of all red knot were counted on the NJ shoreline (88 km). This value is nearly equivalent to that observed in Delaware during the same time when controlling for shoreline length.

Ruddy turnstone occupancy of Delaware beaches showed a significant negative trend over the time series (Figure 3, Nagelkerke's $R^2 = 0.40$, $P < 0.001$) with changepoint analysis indicating this trend began in 2006 (2003–2009 95% CI, Figure 3). In the 12 years prior to this changepoint, a mean of 42% of all ruddy turnstone counted occurred along the 73-km Delaware coast. This has declined to 23% over the most recent 5 years of surveys (2015–2019). At Mispillion harbour, there has been no significant trend ($R^2 = 0.06$, $P = 0.16$), with this 2-km stretch of shoreline holding an average of 10.5% of ruddy turnstone counted over the full 1984–2019 time series.

The trend along New Jersey's coastline has been the opposite of Delaware, with an average of 65% of ruddy turnstones counted now occurring in this zone over the recent 2015–2019 survey interval.

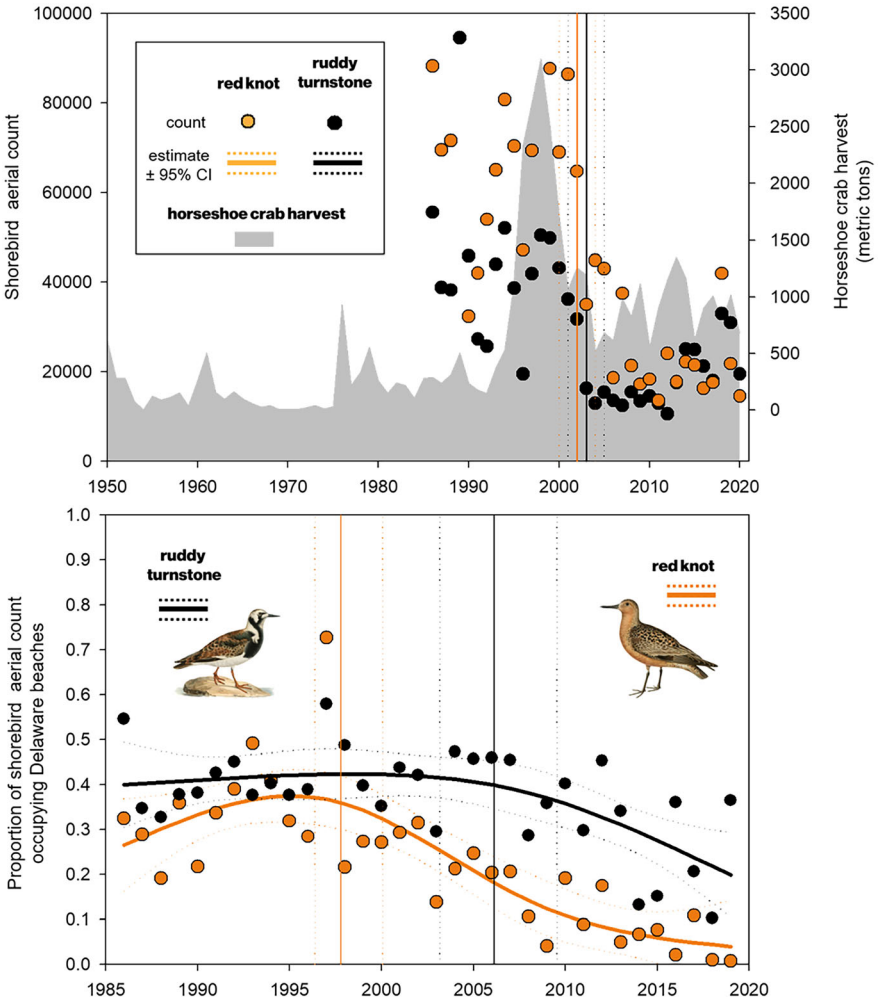


FIGURE 3 Peak aerial counts of red knot and ruddy turnstone during stopover in Delaware Bay. Solid vertical lines (with dashed and shaded 95% confidence interval) indicate a changepoint in abundance in 2002 for red knot and 2003 for ruddy turnstone. Estimated coastwide horseshoe crab harvest from the NMFS Commercial Fisheries Landing Database (Kirkley, 2009) is displayed for reference as a shaded area plot. Art public domain via Von Wright's Scandinavian Birds (von Wright, von Wright & von Wright, 1929).

Before the trend away from Delaware began (1986–2006), a mean of 48% of all ruddy turnstone were counted on the NJ shoreline (88 km). This value is nearly equivalent to that observed in Delaware during the same time when controlling for shoreline length.

3.3 | Egg prevalence

Surface egg prevalence (proportion of samples with egg present) was compared across two periods: 1986–1987 and 2015–2021. The mean prevalence of horseshoe crab eggs in samples (Figure 4) was significantly lower ($P < 0.001$, Table S7) in the more recent period (0.52, 95% CI 0.43–0.60) compared with the 1980s baseline (0.89, 95% CI 0.81–0.94). In both 1986 and 1987 100% prevalence of eggs in samples was reached during the sampling period while it was never reached in the more recent 2015–2021 interval. Peak acceleration in surface egg prevalence (an index for the onset of widespread spawning determined using the second derivative of fit line), ranged from 3–20 May. Per sampling event mean values of egg prevalence and abundance correlated strongly with each other in a negative binomial mixed model that included site as a random effect (Figure 5, marginal $R^2 = 0.78$, conditional $R^2 = 0.81$, $P < 0.0001$), indicating that prevalence can serve as an index of overall egg abundance as long as prevalence levels are below 100% (when the metric can no longer increase correspondingly with abundance).

3.4 | Horseshoe crab spawning habitat quality

Habitat quality (the proportion of egg sampling locations with sand depths > 40 cm) across all sampling beaches was above 80% in all recent sampling years (2015–2021, Figure 6). South Reeds Beach, which was the only sampling site during 1980s egg sampling has retained its high habitat quality, with nearly 100% of sample sites having deep sand. During 2015–2021, both egg abundance (Figure 6) and prevalence (Figure 4) were higher at South Reeds Beach relative to the average value across all sampling sites.

3.5 | Water temperature

In 1986 and 1987, there was a clear difference in the timing of the season with peak acceleration of egg prevalence occurring on May 3 in 1986 and May 15 in 1987 (Figure 4). A potential explanation for

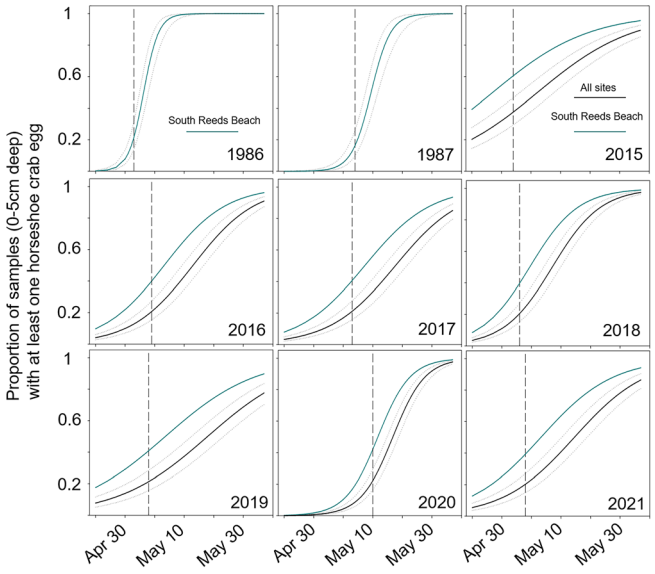


FIGURE 4 Logistic regression analysis of egg presence/absence in samples across 9 years and spanning two eras of sampling (1980s prior to unregulated harvest and 2015–2021). Vertical dotted lines indicate the peak acceleration in slope (second derivative) which we consider to be an index for the onset of widespread spawning. Steeper slopes that reach an asymptote of 100% prevalence of eggs in samples indicates a strong pulse of eggs into the system, whereas flatter slopes that only approach the asymptote later indicate a weaker pulse.

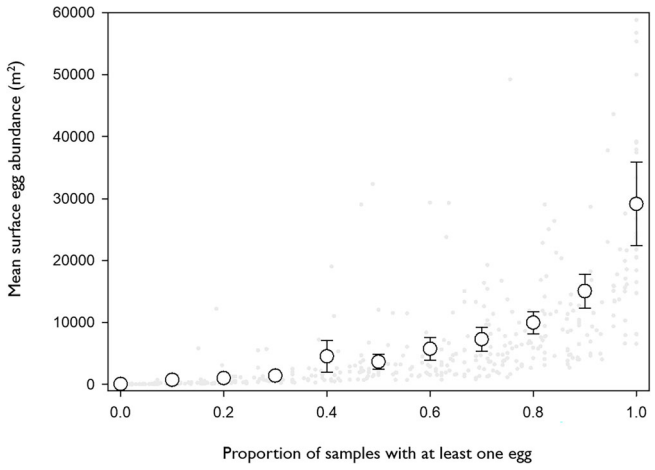


FIGURE 5 The correlation of egg prevalence (proportion of samples with at least one egg) with egg abundance. Light grey data points represent individual site-sampling event averages of prevalence and abundance. White dots are summary values for 10% increments with 95% confidence interval.

this is variation in May water temperature. Satellite-derived temperature data indicate that during the first week of May water temperatures in 1987 were 1.5°C lower than 1986 during the same period (Figure S8). In the three subsequent weeks spanning May and early June, this difference became more pronounced, increasing by 0.5°C/week so that temperatures in 1987 were 3°C cooler than 1986 in late May. For reference, we contrast these water temperatures with those of 2003, which was a notoriously cold-water year (Niles et al., 2009) that had the lowest surface egg abundance of the entire time series examined here (Table S6). The 1987 and 2003 temperature estimates were within 0.5°C of each other from late April to mid-May, with 1987 diverging after that with a steeper rise in temperature. For 1990 and 1991, both years experienced water temperatures above that of 1986 (Figure S8), when widespread spawning occurred in early May (Figure 4). This indicates that temperature thresholds necessary for horseshoe crab spawning were probably reached in early May in 1990 and 1991 as well.

During the 2015–2021 time series, water temperature correlated with egg prevalence ($P < 0.0001$, Table S9). This is particularly true during mid to late May when the greatest variation in both water temperature and egg prevalence occurred (Figure 7). For the 9–16 May and 17–24 May periods in the 2015–2021 sampling era, water temperature ranged by 5°C during both periods while egg prevalence ranged by 25% during both periods. For 25 May–1 June, water temperature varied by 3°C while egg prevalence only varied by 10%. After 1 June, variation in prevalence decreased further indicating that in these two later periods water temperature no longer strongly influenced spawning activity.

A comparison between temperatures at the mouth of Delaware Bay and those just offshore of beaches within the bay (Figure S8) at the same time step revealed a strong correlation ($R^2 = 0.85$, $P < 0.001$), with the inshore water on average 0.95 ± 0.09°C warmer than the offshore zone.

4 | DISCUSSION

This study demonstrates that horseshoe crab egg availability in Delaware Bay is now an order of magnitude lower than it was under baseline conditions in the 1980s prior to a wave of uncontrolled harvest of horseshoe crabs the following decade. A time series of horseshoe crab egg sampling data extending from the 1980s to the present indicates that horseshoe crab egg abundance dropped to these low levels just after this wave of overharvesting. As food resources diminished, shorebird populations documented during aerial surveys in Delaware Bay experienced an abrupt decline that began near the peak of horseshoe crab harvest in 1998. The rate of decline flattened approximately 5 years after declines began (2002–2003), with populations stabilizing at 30% of the baseline population count for red knot and 40% for ruddy turnstone.

Multiple stressors affect both horseshoe crabs and shorebirds as they move through complex life cycles spanning vast areas as they progress through precisely timed life history events. More than half of North America's shorebird species are considered to be of high conservation concern due to unabated threats and population declines (U.S. Shorebird Conservation Partnership, 2014; Hope et al., 2019). Given this broad pattern, it is plausible that trajectories

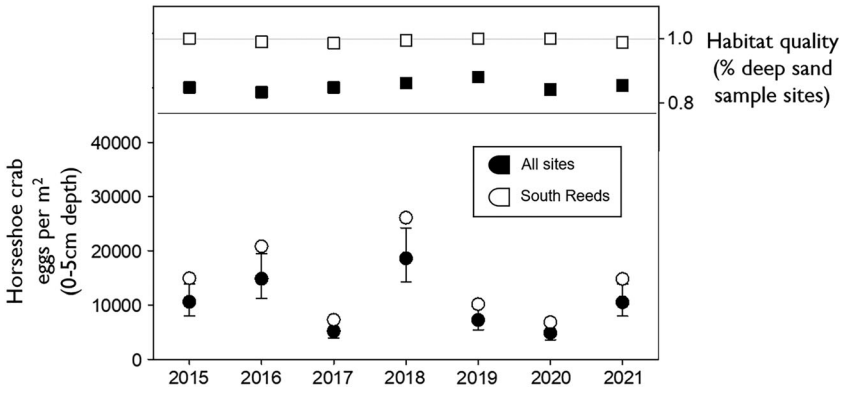


FIGURE 6 A comparison of habitat quality and horseshoe crab egg abundance across all sites and South Reeds Beach. South Reeds Beach is displayed to illustrate that habitat quality as measured by sand depth on the beach has not declined since sampling first occurred there in the 1980s.

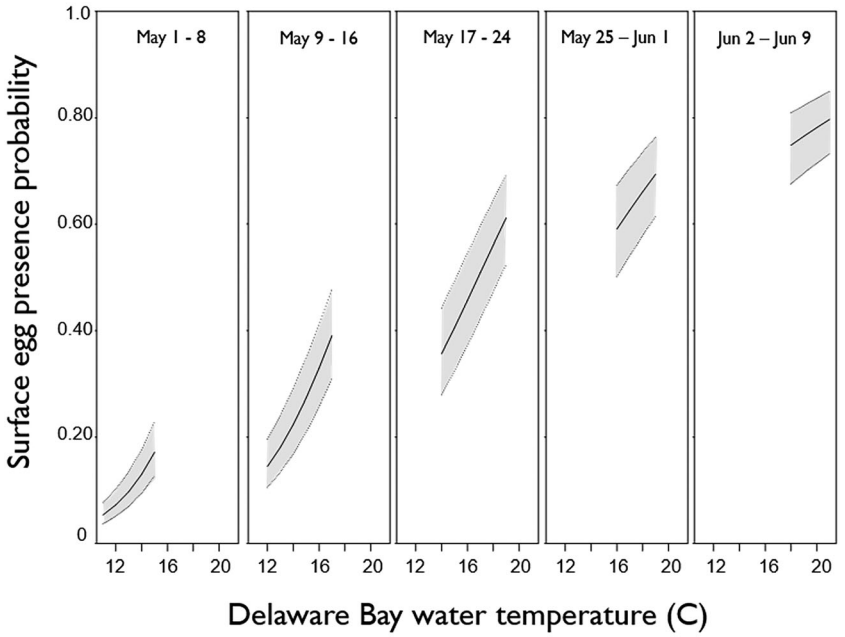


FIGURE 7 Egg prevalence (proportion of samples with at least one egg present) modelled as a function of temperature across five time periods corresponding with 8-day average temperature data from satellite imagery. Truncated curves in each time period represent the observed temperature range across the (2015–2021) study interval.

of shorebird populations stopping over in the bay are governed by factors beyond conditions encountered in the Delaware Bay. For example, one hypothesis concerns Arctic climate change altering patterns of reproductive output but to date, no clear pattern linking shorebird declines to Arctic breeding conditions has emerged (Weiser et al., 2018; Bulla et al., 2019). Shorebird population declines instead have been linked to adult survival (Weiser et al., 2020), with conditions that reduce survival typically encountered away from breeding sites (Weiser et al., 2017) during migration, stopover and wintering periods (Murray et al., 2018).

There is empirical support for stopover population size of shorebirds scaling with prey availability and quality (Witte, 2019). Such a pattern can only be explained by two possibilities that are not mutually exclusive: the birds disperse to other sites, or lower prey availability and quality at stopover sites drive population trends (Studds et al., 2017). Although red knot use other spring stopover sites on the east coast of North America (Smith et al., 2008; Smith, Watts, et al., 2017), there is no evidence that the enormous populations of shorebirds using Delaware Bay prior to horseshoe crab overharvest dispersed themselves among other sites and the overall decline was confirmed at key wintering sites (Baker et al., 2004) where the population has remained at these reduced levels (Morrison, Ross & Niles, 2004; Dey et al., 2019). However, limited anecdotal evidence based on band resights (bandedbirds.org) suggests that individual red knots arriving in Delaware Bay during conditions of low food availability may disperse to other sites. The added delay and added energy expenditure could still ultimately contribute to lower survival and reproductive success. Indeed, it has been established that annual survival of red knots stopping over in Delaware Bay (Duijns et al., 2017) and elsewhere (Morrison, Davidson & Wilson, 2007) is influenced by the relative body condition of the birds during stopover, i.e. their feeding success, rate and quantity of mass gain.

Coincident with shorebird population decline in Delaware Bay was the initiation of a steady trend of redistribution of shorebirds along the Delaware Bay shoreline away from Delaware and towards New Jersey, with the majority of the stopover population of red knots and ruddy turnstone occurring on New Jersey beaches during aerial shorebird surveys over the last 10+ years. At baseline conditions,

these species were evenly distributed between the shorelines of the two states. Given that patterns of horseshoe crab egg abundance determine shorebird distribution in Delaware Bay (Karpanty et al., 2006), the most apparent overarching hypothesis for shorebird redistribution is that foraging profitability has changed from an even to a patchy distribution along the bay's shoreline.

There are several explanations that can be proposed for this pattern. First is that the annual closure of New Jersey beaches along the bay creates more attractive foraging conditions when compared with Delaware beaches, which remain open to recreational use (Niles et al., 2008) which may pose a disturbance threat to shorebirds. However, at baseline shorebird abundances, the beaches on both sides of the bay were open to public use (Burger et al., 2004). A second potential explanation is that with reduced horseshoe crab populations, abiotic factors such as beach aspect, wave exposure and nearshore morphology (Smith et al., 2002; Nordstrom et al., 2006; Jackson et al., 2014) play a larger role in transferring buried horseshoe crab egg clusters to the surface where they are accessible to shorebirds. Variation in these physical attributes around the bay along with overall spawning output in turn may yield more patchy availability of eggs.

The opposing explanation for evenly distributed shorebird populations under baseline conditions is that at high horseshoe crab population levels, the primary mechanism for the generation of surface eggs was exhumation of clusters by successive spawning waves of horseshoe crabs, with physical factors falling to a secondary role (Jackson et al., 2005). Horseshoe crab eggs available for shorebird feeding (Smith, 2007) would reach peak levels when the capacity of beaches to hold egg clusters reaches a maximum early in the season.

Habitat saturation is a quantifiable point where spawning continues to occur, but cluster abundance has reached an asymptote and subsequent spawning only serves to replace prior waves of spawning effort. An initial strong pulse of spawning in mid-May during the full or new moon fills spawning beaches nearly to capacity with clusters, with subsequent waves of spawning horseshoe crabs exhuming previously deposited egg clusters and thus generating large quantities of surface eggs. Surface egg prevalence data (Figure 4) indicate that in the 1980s there was a strong pulse of spawning activity that yielded a steep ascent between the time when widespread spawning began and the time when surface egg prevalence reached an asymptote of 100% prevalence of eggs in all samples over the course of 3 weeks spanning the shorebird stopover period. In contrast, this asymptote was never reached during 7 recent sampling years (2015–2021).

With a weaker pulse of spawning output, habitats are not reaching egg cluster carrying capacity. In sampling specifically designed to sample egg clusters rather than individual eggs, cluster abundance only reached a peak after the majority of shorebirds had departed the bay (Smith et al., 2020). This shortfall is not due to a diminishment of habitat quality over time given that the vast majority of samples were taken at locations with sand depths greater than 40 cm. A failure to reach spawning habitat carrying capacity may also explain why we have observed only incremental increases in horseshoe crab egg availability for shorebirds over time despite coordinated management of horseshoe crab harvest. That is, rather than surface egg abundance increasing linearly with an increasing horseshoe crab population, instead a threshold of spawning horseshoe crab abundance may need to be reached before egg supplies for shorebirds reach the abundances necessary for shorebird population recovery.

A weaker pulse of spawning output may also lead to lower ecological resilience to unfavourable conditions. Examination of water temperature patterns indicates that years with colder water in early to mid-May were associated with delayed spawning in both the 1980s and recent years. Delayed spawning and diminished food availability during the stopover period can lead to impacts on survival and reproductive outcomes in shorebirds (Duijns et al., 2017). In the 1980s, although cold water delayed the onset of widespread spawning in 1987, an intense pulse of spawning occurred once water levels reached the necessary threshold. This yielded egg abundances that matched those of the previous year, which did not experience a spawning delay. These results suggest that the high abundance of spawning output of horseshoe crabs buffered the impact of the delayed season on shorebird populations.

Stock assessments of Delaware Bay horseshoe crabs are consistent with the results presented here showing horseshoe crab egg and shorebird abundance stabilized at low levels after harvest management was implemented. The most recent assessment concluded that the Delaware Bay horseshoe crab population has not markedly changed from the level documented at the peak of overharvest in 1998 when regulation and management of the horseshoe crab population first commenced (Atlantic States Marine Fisheries Commission, 2019). Taken together these three datasets suggest that horseshoe crab harvest management succeeded in arresting declines in horseshoe crab and shorebird populations, but progress toward recovery has been limited.

Our findings indicate that horseshoe crabs have a diminished ecological role in Delaware Bay where they provision a now-diminished seasonal energy pulse to not only shorebirds but a broad suite of commercially and ecologically important fish species (DeSylva, Kalber & Shuster, 1962). This may be the case worldwide among the four species of horseshoe crabs that occur in the estuaries of North America and Asia. Asian horseshoe crabs (*Carcinoscorpius rotundicauda*, *Tachypleus gigas*, *Tachypleus tridentatus*) are critically imperilled (John et al., 2018), while American horseshoe crab populations are experiencing varying trajectories (Smith, Brockmann, et al., 2017), with most either declining or stabilized at baselines established after recent unregulated overharvest (Atlantic States Marine Fisheries Commission, 2019).

While harvest pressures have eased, mortality levels associated with commercial fishing bycatch and horseshoe crab blood extraction are poorly understood. The horseshoe crab blood extraction industry, which manufactures *Limulus* amoebocyte lysate and *Tachypleus* amoebocyte lysate for use in the global medical system to test for bacterial contamination of all substances and medical devices that enter the human body (Tinker-Kulberg et al., 2020).

Although global demand for this substance (attainable only from live horseshoe crabs) is on the rise, the conservation impact of this practice remains unclear (Gauvry, 2015). This is partially due to a lack of transparency of industry practices (Atlantic States Marine Fisheries Commission, 2019) as well as a lack of clarity regarding the level of mortality populations are experiencing as a result of the blood harvest (Rudloe, 1983; Kurz & James-Pirri, 2002; Leschen & Correia, 2010; John et al., 2011; Anderson, Watson & Chabot, 2013). This uncertainty and limited existing management authority over the global blood extraction industry make it difficult to ascertain the contributing roles of the blood harvest, bait and bycatch fishing mortality as well as the demographic legacy of past overharvest.

With no clear indication of population recovery of shorebirds and horseshoe crabs despite 2 decades of management interventions to curtail horseshoe crab harvest, monitoring and management may need to adapt and improve in order to meet its stated objectives. One critical element hindering the evaluation of management success has been the lack of baseline information on horseshoe crab populations and their spawning output. Here we establish that baseline for horseshoe crab egg abundance and illustrate sampling methods that can be applied to track progress toward recovery of this resource and to characterize stopover habitat quality for shorebirds. In addition, management effectiveness needs to be understood in the context of unaddressed and poorly understood population impacts from fisheries bycatch and lysate production, which may be offsetting management progress.

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CONFLICT OF INTEREST

The authors have no competing interests to declare.

DATA AVAILABILITY STATEMENT

Data may be made available upon request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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Exhibit K

A Call for Intervention

The Decline of South Carolina's Horseshoe Crab Population



Defenders of Wildlife is a national, nonprofit membership organization dedicated to the protection of all native wild animals and plants in their natural communities.

Defenders has worked to conserve migratory shorebirds and the resources they rely on for decades, including in South Carolina. We played a major role in securing Endangered Species Act listing as threatened for the rufa red knot, a subspecies (*rufa*) that relies on horseshoe crab egg availability to survive its northbound migration. We also compelled the U.S. Fish and Wildlife Service to propose critical habitat for the red knot and successfully litigated over the illicit harvesting of horseshoe crabs from Cape Romain National Wildlife Refuge, near Charleston, South Carolina. Defenders is an active member of the Horseshoe Crab Recovery Coalition and advocates before state and federal agencies for expanded protections for horseshoe crabs.

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Cover Photo: Horseshoe Crabs on Beach © Ariane Mueller

Overview

The American horseshoe crab (*Limulus polyphemus*) is a unique, primordial animal. Having evolved little over hundreds of millions of years, this "living fossil" is more closely related to spiders and scorpions than crabs (Walls et al., 2002).

The horseshoe crab can be found from Maine to the Yucatan Peninsula in Mexico (South Carolina Department of Natural Resources [SCDNR], 2019b) and spends most of the year dwelling on the ocean bottom until changes in temperature draw adults to spawning beaches in early spring (Walls et al., 2002). Female crabs deposit their eggs among males in excavated nests within the intertidal zone (Brockmann & Penn, 1992).


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In an ancient synchrony, migratory shorebirds time their arrival to coincide with horseshoe crab spawning events. In one of the country's most anticipated wildlife spectacles, red knots and other migrant species converge to feed on horseshoe crab eggs before continuing the journey to their Arctic breeding grounds (Botton et al., 1994). Red knots rely on horseshoe crab eggs in Delaware Bay, South Carolina and Georgia (Botton et al., 1994; Smith et al., 2019; SCDNR, 2013).

Like the bison or passenger pigeon before it, the horseshoe crab was once considered an inexhaustible resource, with spawning aggregations so dense they could be "shovelled up and collected by the wagon load" (New Jersey Geological Survey, 1857, p. 106). Millions were annually harvested from Delaware Bay, site of the country's largest population, to feed the livestock and fertilizer industries (Cramer, 2016). Factories were established near prime spawning beaches, with crabs speared, stacked and ground into fertilizer paste (*The Great King Crab Invasion*, 1871). By the early 1900s, the Delaware Bay population had been depleted (Cramer, 2016; *Knot Then, Knot Now, Knot Later*, 2012).

Today, the species is still managed as a commodity. The horsesboe crab is harvested and bled by the biomedical industry and used as bait by eel and whelk fishermen (Atlantic States Marine Fisheries Commission [ASMFC], 2019). The ASMFC, a compact of state wildlife agencies and industry interests, oversees the management of horseshoe crabs. By developing horseshoe crab benchmark stock assessments, implementing restrictions on the number of crabs harvested for bait and imposing state quotas, the ASMFC has taken important steps to redress historical overharvesting.

Such regulations, however, are applied to bait fishermen only (ASMFC, 2019) and have failed to recover mature female horseshoe crabs, the preferred target of industry (Bi et al., 2020). At roughly 8,000 per square meter, horseshoe crab egg densities in Delaware Bay have shrunk by roughly 80% in the past three decades (Niles, 2021). Similar declines have followed in South Carolina (Niles, 2021; Niles et al., 2021).

Unlike bait fishermen, the biomedical industry has largely avoided regulation, and harvesters are uniquely unencumbered by time, place or quota restrictions (ASMFC, 2019). Despite annually exceeding coastwide kill thresholds meant to trigger intervention, no actions have followed (ASMFC, 2019). Best management practices are suggested but not enforced. Harvesters are generally monitored no more than once per year (SCDNR, 2019c). Little data is publicly shared, moreover, with harvest locations and kill rates kept confidential.

It is within this context that horseshoe crab poaching

has occurred on private lands and national wildlife refuges in South Carolina, where as many as 150,000 crabs are harvested annually (Kinnard, 2021). With nearly a third of harvested female crabs potentially killed per year (Leschen & Correia, 2010), unregulated harvesting has set the stage for declines in horseshoe crab abundance, particularly among smaller, less resilient populations.

This report offers SCDNR[1]—the agency overseeing the state's horseshoe crab harvest—a set of management suggestions necessary to restore oversight and accountability, mitigate the continued decline of the species and foreclose potential conflicts of interest.

Specifically, we recommend that SCDNR:[2]

1. Restrict the timing and manner of harvest practices.
2. Explicitly articulate all relevant closures in the hand harvest permit.
3. Create and implement a horseshoe crab-specific trawl survey.
4. Prohibit the use of horseshoe crab containment ponds, where crabs are held for weeks or months without food before bleeding.
5. Sever financial ties to Charles River Laboratories, the Charleston-based company that produces the pharmaceutical product derived from horseshoe crab blood.

1 For purposes of this report, SCDNR can be stratified into three groups: management or leadership; crustacean researchers; and shorebird biologists.

2 While these actions are far from comprehensive, they provide the first step toward recovering horseshoe crabs and migratory shorebirds in South Carolina.

Red knots fuel up on horseshoe crab eggs before continuing the journey to their Arctic breeding grounds.



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The Keystone Crab

Once considered a "trash fish" (Walls et al., 2002, p. 41), the horseshoe crab has enjoyed a scientific renaissance and is now recognized as a keystone species essential to the survival of many other species.

The horseshoe crab's importance to shorebirds is well-established. Each spring, red knots, ruddy turnstones, semipalmated sandpipers and other notable shorebirds descend on eastern coastal foraging areas to feed on horseshoe crab eggs before resuming their journeys to Arctic breeding grounds (Clark et al., 1993). Horseshoe crab eggs constitute the majority of the gut contents of these birds (Tsipoura & Burger, 1999).

Horseshoe crab eggs are the favored food source for the federally listed red knot and provide the highest energy accumulation rates in the birds worldwide (Piersma et al., 2005). Each knot must consume roughly 400,000 eggs to fuel the second leg of its journey (Cramer, 2018). With breeding season performance, recruitment, and population dynamics correlated to body condition, the birds that fail to acquire such reserves are less likely to survive and reproduce (Duijns et. al., 2017).

Horseshoe crabs lay their eggs 10 to 20 centimeters underground (Botton et al., 2010), making them generally out of reach to shorebirds. Only with repeated spawning by multiple crabs are their eggs distributed onto or just below the surface where they are accessible to the birds (Smith et al., 2002; Smith, 2007). Areas supporting higher densities of horseshoe crabs attract more birds because eggs are likelier to be within their reach (Niles, 2021).

During the 2000s, the overharvest of horseshoe crabs in Delaware Bay was consideted the "key causal factor" in the population decline of the red knot (U.S. Fish and Wildlife Service [USFWS], 2021a, p. 9).

Red knots also rely on horseshoe crab eggs in South Carolina and Georgia (Smith et al., 2019; SCDNR, 2013). One of the single largest flocks—as many as 8,000—has been documented in South Carolina (SCDNR, 2013; SCDNR, 2018c; Smith et al., 2019).

While there, red knots feed on less energy rich coquina clams until the horseshoe crab spawn occurs, at which point they switch diet and disperse to priority crab spawning areas, such as Harbor Island and Deveaux Bank (SCDNR, 2013; SCDNR, 2018c).



GREGORY BREESE/USFWS

Horseshoe crab eggs are a food source for many species, but an indispensable one for red knots.

In Cape Romain National Wildlife Refuge, the foraging distribution of migratory shorebirds, including the red knot, is spatially correlated to horseshoe crab egg abundance (Takahashi, 2016). The eggs produced in Cape Romain provide sustenance to not only the red knot, but also to the ruddy turnstone, short-billed dowitcher, semipalmated sandpiper, sanderling and dunlin, with 95% of tested shorebird fecal samples showing traces of eggs (Takahashi, 2016).

Two-thirds of the red knots that forage on South Carolina resources bypass Delaware Bay altogether (SCDNR, 2018c), underpinning the state's unique importance as a staging area for long-distance migrants (Smith et al., 2019).

A wide diversity of marine species also relies on horseshoe crab eggs and larvae, including Atlantic silverside, flounder, striped bass, perch and eel (Shuster, 1982a; Antonucci et al., n.d.). Adult crabs are preyed on by hammerhead and tiger sharks (Cramer, 2016). The species is also considered the preferred prey of the loggerhead sea turtle, with the management of the stock directly tied to alterations in loggerhead foraging patterns (Seney & Musick, 2007).

Following the depletion of the horseshoe crab in Virginia, the loggerhead shifted its diet to secondary prey such as blue crab. After blue crab abundance declined, the loggerhead then resorted to scavenging on net-entangled or discarded fish (Seney & Musick, 2007).

South Carolina's Biomedical Industry

Roughly 700,000 horseshoe crabs are annually harvested and live bled by the biomedical industry (ASMFC, 2020). Limulus Amebocyte Lysate (LAL), the product derived from the horseshoe crab, is manufactured by a handful of companies including Charles River Laboratories operating in Charleston, South Carolina (ASMFC, 2019).

The production of LAL ensures medical devices, such as implants and other intravenous devices, are free of bacterial contaminants (Burgenson, 2020) and supports a multi-million-dollar industry, even though synthetic alternatives are available.

The biomedical industry's annual kill rate can vary according to external stressors such as handling practices, transport, time out of water, etc. (Hurton & Berkson, 2006; Leschen & Correia, 2010).

Bleeding can result in decreased activity levels, failure to respond to tidal rhythms and reduced hemocyanin counts, which could diminish immune function (Anderson et al., 2013). Bleeding can impair mating behaviors (Owings et al., 2019), decreasing the survival of the species. Stress caused by exposure to high temperatures can impact quality and overall health (Coates et al., 2012). Mortality rates can be as high as 30% among bled females (Leschen & Correia, 2010).

The ASMFC adopted a 15% intermediate mortality rate for bled and released crabs (ASMFC, 2019). Best management practices—a set of handling guidelines designed by industry—are assumed to reduce the negative costs of bleeding (ASMFC, 2019).

A Humane Alternative to LAL

Synthetic substitute spares horseshoe crabs

By virtue of its extreme sensitivity, the horseshoe crab derivative LAL has long been considered the most reliable method for bacterial testing to ensure the safety of various pharmaceutical products (Burgenson, 2020).

In recent years, the demand for endotoxin testing has increased (ASMFC, 2020), and so too has the pressure on the wild horseshoe crab stock, inspiring the use of alternative technologies (Burgenson, 2020; Eli Lilly, 2018).

A synthetic alternative–recombinant Factor C (rFC)–precludes the need for LAL and the industry's reliance on wild crab populations. In 2012, the U.S. Food and Drug Administration approved its use if testing methods provide equivalent or better results (U.S. Food and Drug Administration, 2012).

For its equal if not superior reliability, rFC promises an eventual industry-wide transition (Piehler et al., 2020; Bolden & Smith, 2017; Abate et al., 2017). The pharmaceutical giant, Eli Lilly, has already shifted roughly 90% of its testing to the synthetic (Eli Lilly, 2018). The U.S. government contracted to purchase at least 100,000 doses of two COVID-19 drugs tested using rFC (Eisner, 2021b). The synthetic has also been deemed safe for use in Europe (Balfour, 2020).

By discouraging authorities from streamlining its adoption, however, Charles River has obstructed the synthetic's implementation (O'Hare, 2019), while casting doubt on its efficacy (Baldwin, 2021; O'Hare, 2019; Jordan, 2021).

A major European journal recently published an Expression of Concern, chastising Charles River's employees for inappropriately generalizing about the synthetic in 2021 (Brandl, 2021; Eisner, 2021b).

Today, Charles River relies on cartridge technology designed to reduce, but not yet replace, the use of horseshoe crab blood. That technology requires 5% of the LAL (Collins, 2017), yet is purportedly sold for significantly more than the traditional cost, incentivizing continued bleeding (Undisclosed, 2021).

Harvest Numbers

From 2004 to 2020, the East Coast biomedical harvest increased by 138% (ASMFC, 2020; ASMFC, 2005). Based on existing records, much of this growth has been concentrated in South Carolina.

When South Carolina reporting requirements began in 1991, fewer than 5,000 crabs were removed from spawning beaches (Thompson, 1999). Two years later, the number had spiked to roughly 30,000 animals and had nearly doubled again by 1996 (Thompson, 1999). By 2001, 90,000 crabs were being harvested annually (Wenner et al., 2002). Two decades later, that number had further ballooned to an astounding 150,000 animals (Kinnard, 2021). Roughly 25% of the entire biomedical take now occurs in South Carolina (ASMFC, 2019).

In South Carolina, best management practices are generally monitored no more than once per year and rarely practically applied (SCDNR, 2019c). Horseshoe crabs are regularly retrieved by the telson (tail) (Crolley, 2019; Horan, 2019; SCDNR, 2019a) in a manner known to harm the animals (SCDNR, 2019b); indelicately stacked to capacity in uncovered boats (Horan, 2019; Eisner, 2022); and harvested from beaches over 100 miles from the bleeding facility (Smith et al., 2019; Horan, 2019), confounding the true kill rate of the overall bleeding process.

Thousands of crabs are held in man-made ponds for weeks or months before bleeding, without food or regulated pond conditions, exacerbating the negative impacts of bleeding (Linesch, 2017; Hamilton et al., 2019).

Under the most careful of handling conditions, roughly 22,000 crabs are likely killed per harvest season in South Carolina (ASMFC, 2019). Under a 30%



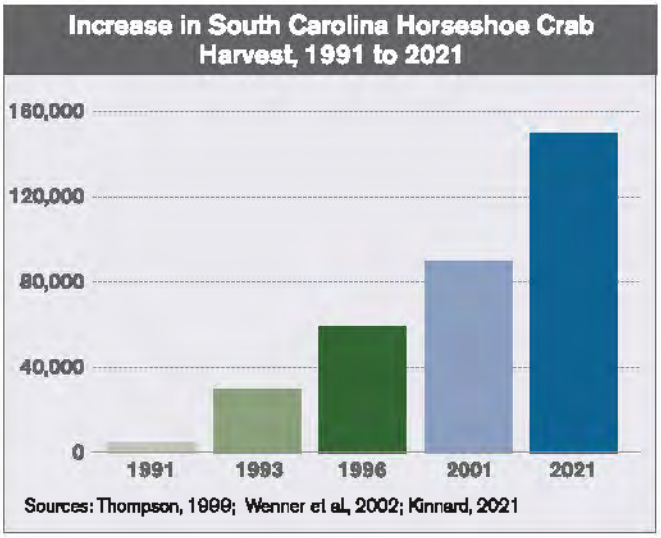
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Technicians bleed horseshoe crabs at a Charlea River Laboratories bleeding facility.

mortality threshold, the kill rate could reach nearly 50,000 per year.

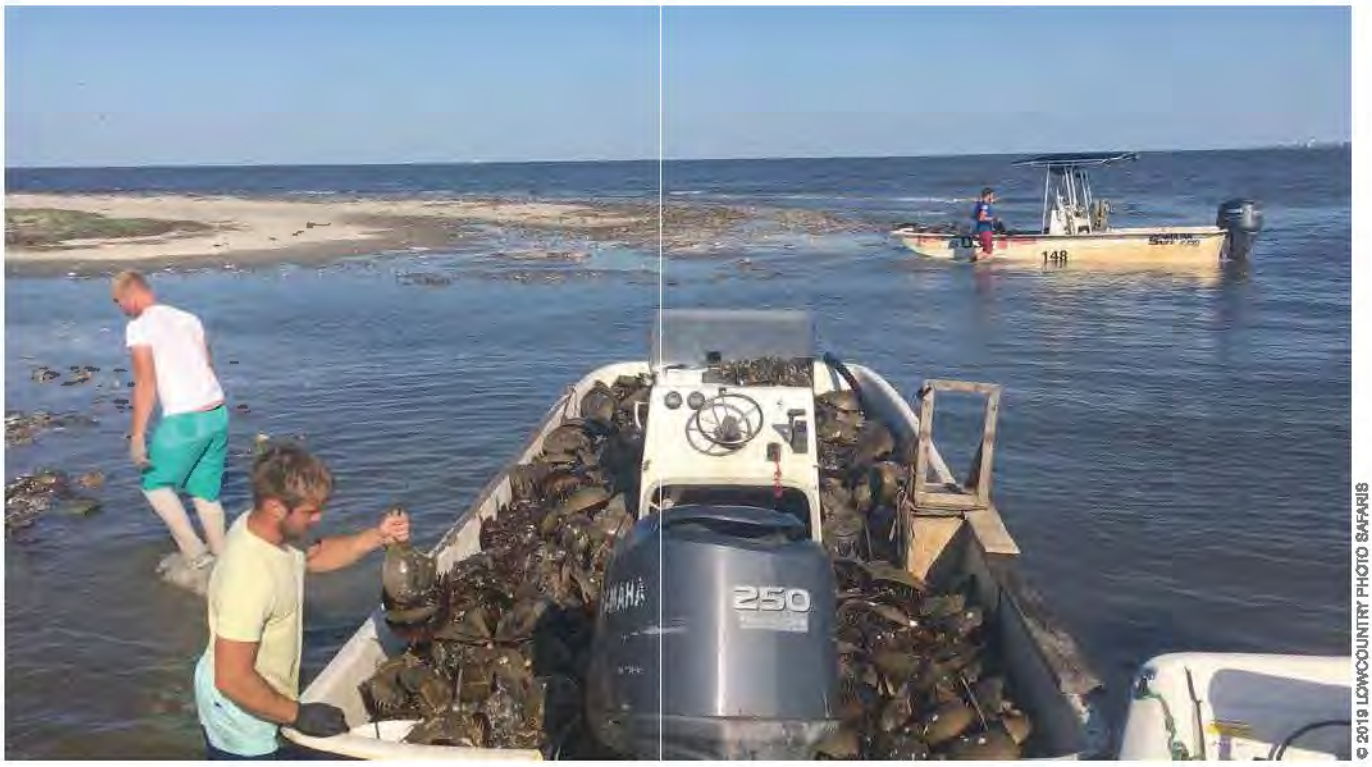
In the early days of harvesting, the impacts on horseshoe crab survival were largely unknown, although the basic principles of precautionary wildlife management were well-established. According to a 1999 study, the exploitation of breeding stocks, without a management plan, could lead to abrupt and significant declines in South Carolina's horseshoe crab population, meriting the crab's listing as a threatened or endangered species (Thompson, 1999). Effective management would therefore require "knowledge of population fitness, distribution, [and] critical habitat requirements" (Thompson, 1999, p. 6), as well as active management on the part of SCDNR (Thompson, 1999).

Similar sentiments were expressed years later, when SCDNR scientists warned that an "unchecked" harvest could result in population declines that would not be apparent for nearly a decade (Wenner et al., 2002, p. 3). The magnitude of the take at that time—over 90,000 animals in 2001—was "of great concern" (Wenner, et al., p. 3) and conducted in a manner unconducive to successful spawning, with crabs removed from beaches during their most sensitive life stage (Wenner at al., 2002).



Over the next decade, research intensified but ultimately yielded few substantive insights into the health of localized horseshoe crab populations. By 2012, SCDNR compliance reports tied "worrisome" sampling declines to increases in harvesting (SCDNR, 2012b, p. 3).

Three years later, researchers again noted the potential for "profound" long-term impacts (SCDNR, 2015a, p. 2), with upwards of as many as 150,000 animals removed from spawning beaches per year (Kinnard, 2021).



A harvester adds a horseshoe crab grabbed by the telson (tail)—a practice that can harm the crabs—to his haul.

After the federal listing of the red knot, SCDNR biologists, among others, expressed the need for horseshoe crab protections (Sanders et al., 2019) and mitigation of human disturbances (SCDNR, 2019e).

Rather than acting on these warnings, SCDNR leadership encouraged the phenomenal growth of industry, while conceding that its surveys were unreliable[3] (SCDNR, 2015b; ASMFC, 1998), and the status of the population structure largely unclear (SCDNR, 2015a).

Today, the male-to-female ratio and locations of juveniles, among other basic data, remain largely unknown.

Even so, *every* crab, regardless of gender, can be harvested in the midst of spawning events, on virtually all South Carolina properties. No caps are imposed on the number killed, and as many as 50,000 are potentially lost each year. Thousands are detained in ponds (Kingsley-Smith, 2017) precluding reproduction. Management decisions are rarely if ever subject to public comment or input. Even harvest data—locations, year-by-year trends, etc.—are withheld from the public.

Between 1993 and 2021, this harvest pressure increased by roughly 400% (Thompson, 1999; Wenner et al., 2002; Kinnard, 2021). Relative to population size, South Carolina's stock may suffer today from the greatest biomedical harvest pressure coastwide (Kinnard, 2021; ASMFC, 2019).

Reports of declines and/or nonexistent spawning have since become commonplace.

Purported Declines

The American horseshoe crab is currently listed by the International Union for Conservation of Nature as "Vulnerable" to extinction (Smith et al., 2016). The IUCN also listed *Tachypleus tridentatus*, a once abundant Asian horseshoe crab, as "Endangered" (Laurie et. al., 2019).

With the Asian population on the decline, increased harvest pressure may shift to North America (Burgenson, 2020), putting added pressure on South Carolina. Whether the population can sustain increased harvesting is unknown.

According to a recent study, the horseshoe crab appears genetically stable (Cushman et al., 2019) and presumably in little need of intervention in South Carolina. Because that study was the first of its kind, it could not quantify the impact that bleeding may have had on the species (Eisner, 2021b).

On-the-ground SCDNR staff, however, are now seeing fewer crabs on spawning beaches (SCDNR, 2019e). In 2018, SCDNR surveys yielded few sightings on priority spawning grounds such as Marsh Island and Hilton Head Island (SCDNR, 2018a), both heavily harvested habitats (SCDNR, 2015a; USFWS, 2019). For two years straight (2017-2018), South Carolina altogether failed to produce a meaningful spawn (SCDNR, 2018b).

On Harbor Island, crabs have been "drastically dropping in numbers," according to local experts (Albert, 2019). Since 2004, the "crabs tagged numbered in the hundreds until 2018 when we only found three individuals. This year we only found two. This sudden decline in crabs has affected the number of migratory birds arriving to refuel for the final stages of their migrations. Birds such as the red knot, once numerous, have been seldom seen…. Having observed both species for the past 10 years it is easy to see a serious problem" (Albert, 2019).

In Cape Romain National Wildlife Refuge, knots have declined and are rarely, if ever, able to feed on horseshoe crab eggs (Niles, 2021), which were once found in suitable quantities on several islands, including Marsh, Bulls and Little Bulls (Takahashi, 2016), depriving them of a critical food source. Once seen in abundance, few if any crabs have been documented in Cape Romain in recent years (Crolley, 2021).

According to a commercial boatman who has spent two days a week on the water since 2009, there has been "a distinct decline in all wildlife in Beaufort County, South Carolina, but especially shorebirds, dolphin [sic] and horseshoe crabs. The latter being especially concern-

3 The same surveys were used by the ASMFC in the development of the latest benchmark stock assessment, which described the trend of the Southeast population as "good." The ASMFC historically discounted nontargeted survey methods of this nature for their inherent shortcomings and potential biases (ASMFC, 1998). See p. 19 for more information.

ing because the horseshoe crab eggs have been the main food source for many migrating shorebirds" (Horan, 2021).

Where hundreds of crabs used to be tagged on important spawning beaches, a former SCDNR biologist now claims to see only four or five at any given point (Eisner, 2022).

Finally, harvesting on Turtle Island Wildlife Management Area, a once-prolific spawning beach, has depleted the local population, according to USFWS (2021c). No spawning has been documented since intensive harvesting occurred in 2019 (USFWS, 2021c), whereas spawning just across the state line in Georgia has remained consistent (Eisner, 2022).

Such declines, reported throughout virtually the entire range in South Carolina, may force red knots to relocate from the state (Niles, 2021), with only Delaware Bay now capable of supporting meaningful egg densities (Niles et al., 2021).

According to biologists with the Georgia Department of Natural Resources (GDNR), "we may be witnessing a collapse" in South Carolina (Eisner, 2022).

Harvest Locations

Generally operating within informal territories, fishermen repeatedly harvest the same population throughout the summer. To prevent recapture, crabs are generally returned to the same focal region, but not the discrete habitat from which they were harvested (SCDNR, 2019d).

Dozens of state-permitted fishermen gather crabs on behalf of Charles River (Rhodes, 2012). Some of these

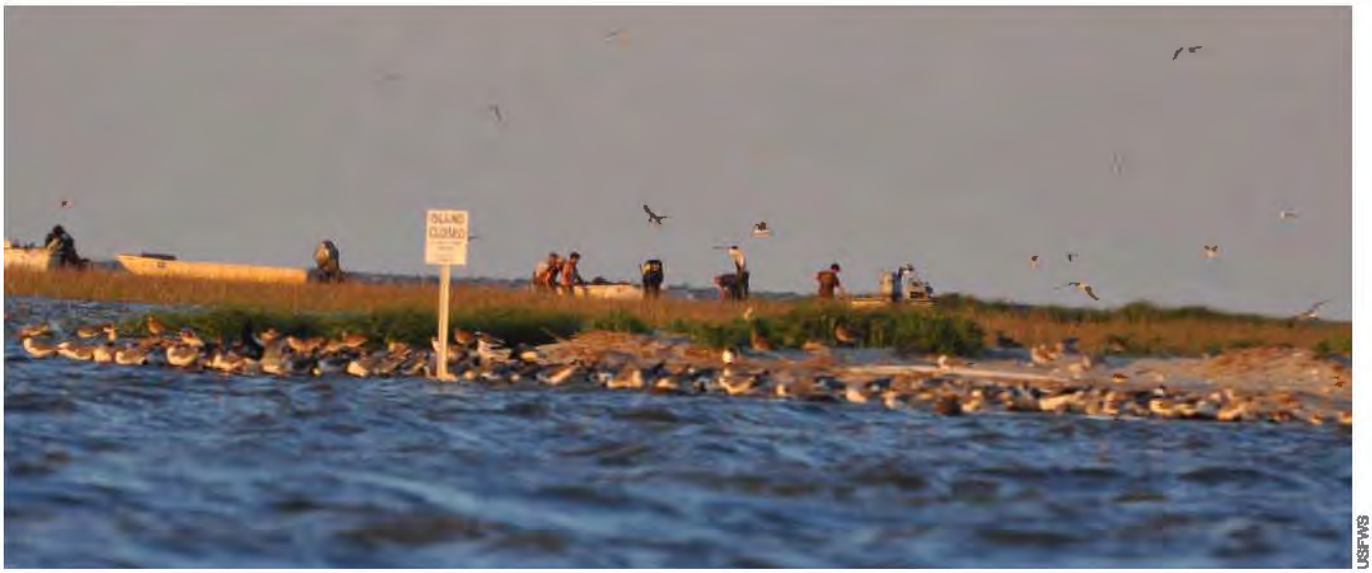


harvested crabs must be transported roughly 30 miles, others far more, to reach the Charleston-based bleeding facility. A handful of harvesters hold crabs in earthen ponds for bleeding at a later date (Hamilton et al., 2019).

Harvesting generally occurs in three focal regions in South Carolina: Beaufort, Edisto and Cape Romain (Egger, 2021). Of the specific harvest locations in these regions, the seven singled out below are notable for either their critical importance to shorebirds, documentation of poaching or a combination thereof.

Poaching has likely occurred on at least five of these properties and potentially more areas in South Carolina. (Horseshoe crabs are also harvested on Hilton Head Island, Daufuskie Island, St. Helena Island, the beach adjacent to the South Carolina Aquarium and James Island, among other places [SCDNR, 2015a; USFWS, 2021d]).

Curtailing harvesting on all of these areas can be achieved through various procedural and substantive mechanisms, such as state-enacted closures, revisions to the horseshoe crab hand harvest permit and active oversight and policing. (See section on management suggestions, page 17).



Horseshoe crab poachers work Marsh Island in Cape Romain National Wildlife Refuge.

Cape Romain National Wildlife Refuge

Renowned for its world-class shorebird habitat, Cape Romain is among the most important wintering and migration areas on the Atlantic Coast, supporting hundreds of thousands of birds (Dodd & Spinks, 2001). The refuge has a higher critical value than both Delaware Bay and all other Pacific, Atlantic and Gulf Coast Western Hemisphere Shorebird Reserve Network sites once overall species richness and presence of declining species are considered (Dodd & Spinks, 2001).

Cape Romain's Marsh Island is the state's only site with documented brown pelican nesting every year since recording began (USFWS, 2019). Over five decades, Marsh Island has supported 18 nesting species of seabirds, shorebirds and wading birds (USFWS, 2019). The island also supports the highest number of red knots on the refuge (Wallover et al., 2015), as well as the state's largest assemblage of roosting and foraging marbled godwits (USFWS, 2019).

Human disturbance is considered a significant cause of shorebird declines, impacting their ability to successfully breed, roost and forage (Pfister et al., 1992; Burger, 1994). Disturbance causes increased flushing from nests and decreased chick survival (USFWS, 2010). Even occupying boats and kayaks *near* nesting islands poses a

threat (USFWS, 2010). Mitigating human disturbance is thus of critical conservation importance (USFWS, 2010).

To that end, USFWS closes Marsh Island, White Banks and Sandy Point to all entry annually from February 15 to September 15, with the closed area extending down to the low mean water mark (50 CFR 26.34(mm)(1)(v); USFWS, 2019).

Notwithstanding these restrictions, a state-licensed fisherman and his crew bypassed island closure signs for roughly a decade, harvesting tens of thousands of crabs in violation of federal law (USFWS, 2019; Dawsey, 2014).

In 2013, SCDNR was "in agreement" that the Marsh Island harvest was not in compliance with federal regulations (USFWS, 2019, p. 3). USFWS also notified Charles River of its violations (USFWS, 2019; Eisner, 2021a). While closures were temporarily honored (Wagner, 2014), poaching resumed shortly thereafter (USFWS, 2019; Boyles, 2018).

During that time, USFWS pled for help from SCDNR in protecting the refuge, meeting with leaders on six occasions (Boyles, 2018). Ultimately, SCDNR denied additional meeting requests (Boyles, 2018); refused to explicitly incorporate the closures into hand harvest permits (Bell, 2014; Bell, 2020; SCDNR, 2019c); and issued continued permits, later claiming USFWS could not close any areas of the refuge to human entry (SCDNR, 2021b).

Defenders of Wildlife and the Southern Environmental Law Center sued USFWS over the unregulated harvesting in Cape Romain, but voluntarily dismissed their case after USFWS announced its intention to regulate the harvest in accordance with federal law.

SCDNR, meanwhile, appears poised to reissue permits to the same poacher (SCDNR, 2021b; Bell, 2020), setting the stage for continued conflict.

Tybee National Wildlife Refuge

Located near the Georgia-South Carolina state line, Tybee National Wildlife Refuge sits at the southern end of Charles River's operating range. Managed primarily for nesting shorebirds (USFWS, 2011), Tybee has supported thousands of red knots and suffers from heavy human disturbance (Smith et al., 2019).

While protected on paper, high levels of harvest have been documented in the refuge (Smith et al., 2019). According to biologists from multiple agencies and states, the magnitude of the horseshoe crab take was "unexpected" and likely "unsustainable" (Smith et al., 2019, p. 15, 18), with thousands taken during peak migration events.

With the refuge closed to public use (USFWS, 2011), the state-permitted harvest on Tybee occurs in violation of federal law, degrading a key foraging area for red knots and other shorebirds.

Turtle Island Wildlife Management Area

In 2019, thousands of red knots were documented on Turtle Island Wildlife Management Area (Smith et al., 2019). Ruddy turnstones, long-distance migrants like red knots, were also seen consuming horseshoe crab eggs before departing to fly straight to the Arctic (SCDNR, 2020a). Various imperiled species such as American oystercatchers and piping plovers use the island as well (*Turtle Island*, 2018).

The migratory birds that visit Turtle Island also rely on Georgia resources in places such as Tybee Bar and Little Tybee Island, apparently utilizing the larger area as one staging site (Smith et al., 2019; SCDNR, 2018c). Conservation actions (or lack thereof) on Turtle Island can thus reinforce or undermine conservation efforts in Georgia.

With that in mind, multiple agencies, including USFWS and GDNR, attempted to mitigate the impacts of the Turtle Island harvest (Smith et al., 2019). Since 2019, however, spawning has not been documented on Turtle Island (USFWS, 2021c), irreparably diminishing a once-prolific South Carolina habitat.



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A harvester collects horseshoe crabs on Turtle Island Wildlife Management Area. Despite efforts to mitigate the impacts of harvesting on the area, no horseshoe crab spawning has been documented on Turtle Island since 2019, the year this scene was recorded.

Bay Point Island

One of the last undeveloped barrier islands in South Carolina, Bay Point Island is considered an Important Bird Area by Audubon (*Morse Creek Inlet/Bay Point Island*, 2018). Hundreds of knots have regularly been documented during migration (Sanders, 2020; SCDNR, 2021b), with as many as 8,000 other birds recorded during winter (*Morse Creek Inlet/Bay Point Island*, 2018).

Despite being privately owned, thousands of crabs are harvested from Bay Point Island and confined to a Beaufort-area containment pond (*Morse Creek Inlet/Bay Point Island*, 2018; Parker, 2021).[4] According to Charles River's agents, development proposed by the island's owner threatens the continued viability of their harvest (Parker, 2021).

In the absence of an agreement otherwise, the harvest on Bay Point Island may occur illicitly.

Deveaux Bank Seabird Sanctuary

Of the 187 miles of South Carolina coastline, Deveaux Bank, a state-managed seabird sanctuary, constitutes less than 1 mile, yet attracts tens of thousands of birds, including red knots, black skimmers and virtually every coastal bird species of "greatest conservation need" in South Carolina (*Deveaux Bank*, 2017; Cramer, 2021).

Deveaux Bank is considered by some without equal, supporting almost 20,000 roosting whimbrels (Sanders et al., 2021), the east's largest brown pelican colony (*Deveaux Bank*, 2017; Cramer, 2021) and thousands of red knots (Smith et al., 2019). Few sites anywhere in the region support the diversity or abundance found on Deveaux.

Many of Deveaux's iconic species—piping plover, whimbrel, red knot—are vulnerable to human disturbance (Gibson et al., 2018; Wilke & Johnston González,

4 The harvester's name has been intentionally withheld. While it is argued that harvesters operate in the intertidal zone on properties restricted above high tide, such as Bay Point Island, SCDNR correspondences indicate that harvesters move above high tide, then beneath it, depending on the presence of observers.



2010; USFWS, 2021a). Full intertidal closures are considered necessary to protect Deveaux's peerless wildlife (Eggert, 2012).

With limited restrictions, boaters, recreationists and anglers nonetheless make regular incursions onto Deveaux (Cramer, 2021; *Deveaux Bank*, 2017). Horseshoe crab harvesting also occurs on an annual basis (SCDNR, 2015a), often at night when birds are most easily disturbed.

Because horseshoe crabs spawn over months, harvesters return to Deveaux, repeatedly disturbing birds throughout early summer, diminishing its already limited protections.

Morgan Island

Located within the ACE Basin National Estuarine Research Reserve, Morgan Island hosts a population of monkeys used for medical research purposes. The property itself is leased by SCDNR to Charles River for roughly $1.5 million per year (Beaufort County, South Carolina, 2017; Eisner, 2022).

By virtue of the lease agreement, the taking of wildlife is strictly prohibited (Beaufort County, South Carolina, 2017; Eisner, 2022). Former SCDNR staff have nonetheless documented harvesters on Morgan Island, operating above low tide and beyond no entry signs (Eisner, 2022).

Parris Island Marine Corps Recruit Depot

Owned and operated by the U.S. Marine Corps (USMC), Parris Island serves as a recruit depot for marine training purposes. Although federal ownership extends to the channel (Presidential Proclamation, 1918; Redacted Author, 2021), harvesters have operated on Parris Island for years (SCDNR, 2015a; Horton, 2021), boating to the island and removing crabs without permission. At least one poacher has been intercepted by Parris Island law enforcement, though harvesting has largely continued unabated (Redacted Author, 2021; Horton, 2021).

USMC has discussed changes to the hand harvest permit with SCDNR (Redacted Author, 2021; Horton, 2021)—namely, the specific inclusion of Parris Island as a restricted area—but, as of December 2021, the agency had yet to commit (Horton, 2021).

Case Study: Carl N. Shuster Jr. Horseshoe Crab Reserve

In 2001, the National Marine Fisheries Service established 30 nautical miles off the mouth of Delaware Bay from south of Atlantic City, New Jersey, to just north of Ocean City, Maryland, as a horseshoe crab sanctuary. Named for pioneering horseshoe crab researcher Carl Shuster, the reserve limited possession and prohibited fishing of horseshoe crabs adjacent the bay (Restricted Gear Areas, 2001).

Shortly after the designation of the reserve, however, a biomedical company received an exemption, allowing the harvest of up to 10,000 crabs per year (Atlantic Coastal Fisheries Cooperative Management Act Provisions, 2016). In turn, harvesters tagged 15% of crabs and provided morphological data on the catch. The exemption was reissued on multiple occasions (Atlantic Coastal Fisheries Cooperative Management Act Provisions, 2016), arguably undermining the reserve's founding purposes.



In a similar vein, Charles River has requested access to the ACE[1] Basin National Estuarine Research Reserve in South Carolina. As one of the last potential viable spawning sites, the reserve's islands were set aside to monitor spawning, larval abundance, and survival (Jenkins, 2016), providing a control similar to the Carl Shuster Reserve.

SCDNR met with Charles River to discuss the prospect in July 2021 (Kinnard, 2021; SCDNR, 2021a). Shortly thereafter, the company requested universal access to all crabs under the state's jurisdiction, "*in exchange*" for $500,000 of cash resources and added data gathering (Flynn, 2021, p. 2; Eianer, 2022) (emphasis added).

Potential changes of this nature would be enshrined in the SCDNR horseshoe crab hand harvest permit.

1 ACE stands for the Ashepoo, Combahee and Edisto rivers.



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South Carolina Gov. Henry McMaster watches a video of the bleeding of horseshoe crabs during a visit to Charles River Laboratories in Charleston on August 6, 2021.

A Conflict of Management

When Charles River began harvesting operations, the company successfully advocated for legislation that prohibited the use of horseshoe crabs as bait. The resulting bill, drafted by Jim Cooper of Charles River, effectively privatized the use of a public trust resource, banning other commercial uses (Cooper, 2019). Since then, Charles River assumed a key role on the advisory panel of the ASMFC, regularly downplaying the impacts of the bleeding process (Cooper, 2019; ASMFC, 2019) and guiding the management of the species.

The horseshoe crab is listed today by SCDNR as one of two marine invertebrates of the highest conservation priority (SCDNR, 2014).

While various research efforts have followed (SCDNR, 2015a; SCDNR, 2015b), often with Charles River's funding (Eisner, 2020b), few if any tangible restrictions designed to prevent declines have been implemented (SCDNR, 2019c). Management suggestions from shorebird biologists have also gone largely unheeded.

According to SCDNR biologists, "efforts should be made to identify and protect foraging areas" in South Carolina (SCDNR, 2013, p. 6), since red knots often bypass Delaware Bay altogether (SCDNR, 2018c). One of the "first steps" toward that end must be the safeguarding of horseshoe crabs and coquina clams (Sanders et al., 2019, p. 1). Because red knots are unable to habituate to human presence, disturbances must also be mitigated (SCDNR, 2012a).

Today, most ***if not all*** priority red knot foraging areas suffer from heavy harvest disturbance, with fisherman and birds now vying for the same resources, at the same time of year, often during the agency's own monitoring efforts (Smith et al., 2019; SCDNR, 2015a). These interactions, according to SCDNR, reduce the number of red knots and the time they spend consuming prey (2012a).

Such conflicts in management—encouraging unencumbered harvesting, while trying to protect shorebird resources—have degraded even the most high-value habitats in South Carolina

For instance, Cape Romain supports 70% of South Carolina's royal and sandwich tern nests alone, as well as half the American oystercatcher population (*Cape Romain Bird Steward*, n.d.). In 2020, DNR hired a shorebird steward to work with the federal government

in protecting the refuge from human disturbance (*Cape Romain Bird Steward*, n.d.).

Three days after Charles River met with the state, however, South Carolina intervened in litigation (Moore, 2021), arguing that USFWS could not close any portions of the refuge. The same areas patrolled by the shorebird steward were those DNR leadership refused to protect from harvesting (*Cape Romain Bird Steward*, n.d.; Boyles, 2018; SCDNR, 2021b).

The state also encouraged the designation of critical habitat—a framework meant to facilitate the red knot's recovery—while demanding that some of those same priority areas be opened to commercial harvesting (SCDNR, 2021b).

In some cases, efforts to limit recreational disturbance have succeeded. Specific calls for reform to horseshoe crab harvesting practices have been rebuffed, however (Smith et al., 2019; Hunt et al., 2020; Bell, 2020). Federal efforts to mitigate its impacts have also failed (Boyles, 2018; USFWS, 2019).

Shorebird biologists from multiple states now consider runaway horseshoe crab harvesting in South Carolina the *"most significant shorebird conservation issue moving forward in the region"* for its inherent disturbances and potential to deprive shorebirds of sustenance (Smith et al., 2019, p. 17) (emphasis added).

Recommended Management Actions

To address the issues raised in this report, we recommend SCDNR commit to the following precautionary management actions.

1. Restrict the timing and manner of harvest practices.

Horseshoe crabs are harvested by hand during tidal events before they have an opportunity to spawn, potentially impeding reproduction of the species (Wenner et al., 2002). To mitigate these dangers, SCDNR studied alternative collection methods in the early 2000s. The resulting data cautioned against harvesting during the high tide (Wenner et al., 2002).

While enforcement challenges would preclude the effective implementation of hourly restrictions, the principle applies: To ensure continued spawning, SCDNR must enact a series of full-day closures to prevent the interception of the crabs before they arrive on spawning beaches.

Enacting five-day closures around the new and full moons of April, May and June, for instance, could yield significant conservation gains.[5] The success of such an approach, however, would require the closing of containment ponds, where crabs are held throughout summer.

Harvesting should furthermore be prohibited on *all* known foraging red knot locations during the months of migration. State biologists have repeatedly called for the protection of crab eggs (SCDNR, 2013), the shielding of knots from human disturbance (SCDNR, 2012a), and the maintenance of inviolate habitats (Sanders et al., 2019). Without such measures, continued declines—in potential violation of the Endangered Species Act—are expected.

These foraging locations include, but not are not limited to (see USFWS, 2021b, for additional locations):

- ACE Basin National Estuarine Research Reserve (various islands)
- Bay Point Island
- Bird Key-Stono
- Cape Romain National Wildlife Refuge
- Capers Island
- Daufuskie Island
- Deveaux Bank
- Fripp Island

5 In Massachusetts, harvesting is prohibited on spawning beaches two days before the new and full moon and two days after, from April through June (*2021 horseshoe crab lunar spawning closure dates*, 2021).

- Harbor Island
- Hilton Head Island
- Seabrook Island
- Turtle Island Wildlife Management Area
- Tybee National Wildlife Refuge

Finally, crustacean researchers and shorebird biologists should collaboratively design a joint management framework focused on maintaining adequate spawns, providing undisturbed foraging for migratory birds and protecting additional priority roosting and nesting habitats. Publicly available records indicate that such collaboration has been lacking, with SCDNR researchers and biologists operating within their respective siloes and communicating little about these issues.

2. Explicitly articulate all relevant closures in the hand harvest permit.

Before the harvest season commences each year, SCDNR reissues saltwater fishing permits, articulating handling, transportation and return-to-water requirements. The permit generally covers a three-to-four-month window and must be renewed annually (SCDNR, 2019c).

The current permit explicitly notes closures within the ACE Basin National Estuarine Research Reserve but falls short of describing closures elsewhere (SCDNR, 2019c). Although SCDNR has the authority to list closures in the permit (SC Code § 50-5-1330, 2019), the onus is on harvesters to determine, on a property-by-property basis, which habitats are off-limits (SCDNR, 2019c). The practical effect is that few if any areas are considered restricted.

Federal land managers and nonprofits have advocated to no avail for explicit permit revisions (Hunt et al., 2020; Bell, 2014; Boyles, 2018). Nevertheless, we are persisting and encouraging the listing of *all* closed areas (national wildlife refuges, state parks, etc.), particularly those where poaching is known to occur.

We further suggest that harvest privileges be withheld from at least two poachers, whose names we can provide, to restore a sense of competitive equity for those operating within the law. Doing so would foreclose poaching on at least three, and possibly more, properties.



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Finally, in place of the permit's suggested handling practices, the vagueness of which precludes effective guidance (SCDNR, 2019c), the hand harvest permit should:

- Require the use of refrigerated trucks for transporting crabs, which are uniquely vulnerable to temperature-related impacts in South Carolina (Coates et al., 2012).
- Impose a 24-hour window in which to harvest, bleed and return crabs to water.
- Prohibit the handling of crabs by the telson.
- Mandate the marking of bled crabs to prevent recapture.

3. Create and implement a horseshoe crab-specific trawl survey.

By virtue of their passive, incidental nature, surveys used to assess horseshoe crab population trends in South Carolina are fundamentally limited (SCDNR 2015b) and of questionable reliability. None of SCDNR's surveys are designed solely for horseshoe crabs.

The ASMFC has long discounted coastwide trawl, dredge and other surveys of this kind, noting that while useful for general trends within specific areas, "each is complicated by factors that may bias the data, such as sampling error, inappropriate equipment or incomplete sampling effort" (ASMFC, 1998, p. 22).

Only one survey—the horseshoe crab-specific Virginia Tech trawl survey—has been considered fully reliable by the ASMFC (ASMFC, 2013; Niles et al., 2021), although it has yet to be replicated elsewhere.

In 2019, the ASMFC nonetheless developed a regional benchmark stock assessment utilizing state surveys of various methodologies. The ASMFC was unable to estimate male-to-female ratios or determine the structure or spawning success of discrete populations in South Carolina (ASMFC, 2019). Despite these shortcomings, the ASMFC's assessment is used by industry to justify unregulated harvesting in South Carolina (Jordan, 2021), while anecdotal reports of declines are dismissed.

In place of these surveys, SCDNR should design its own horseshoe crab-specific survey, with support from university, state and nonprofit partners.

Robust egg monitoring programs should also be consistently implemented. Horseshoe crab egg densities offer a clear connection to recovery trends for crabs and birds alike, while providing a backstop against which to examine trawl surveys (i.e., trends in trawl survey results should be closely mirrored by egg densities [buried egg clusters and surface eggs]).

In the absence of such data, SCDNR cannot defensibly condone harvesting on the scale seen today.

4. Prohibit the use of horseshoe crab containment ponds.

Crabs harvested from the Beaufort area are often deposited in earthen containment ponds, where they are stored for later bleeding. Unique to South Carolina, the practice deprives shorebirds of eggs, with crabs often stored for the entire summer when they would otherwise be spawning on beaches (SCDNR, 2020b).[6]

With numerous operators (Bell, 2015), containment ponds can encompass nearly 50 acres, holding anywhere from 10,000 to 15,000 crabs, according to Charles River (Egger, 2021).

SCDNR does not limit the number of crabs held in ponds or the duration held (SCDNR, 2020b). Crabs are not fed during detention, nor are specific habitat conditions required of operators (SCDNR, 2020b). Every year, thousands spawn in vain and die, trapped in the unsanitary, overcrowded conditions (Hamilton et al., 2019).

Because females produce upwards of 80,000 eggs per season (Taft, 2016), ***billions*** of eggs can be lost in ponds, endangering the long-term survival of the species.

Twenty years ago, roughly 10% of harvested crabs were held in containment ponds (Wenner et al., 2002). Today,



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Horseshoe crabs waiting to be bled are held in containment ponds like this, a practice only South Carolina permits.

6 In January 2022, Defenders of Wildlife and the South Carolina Coastal Conservation League, represented by the Southern Environmental Law Center, sued SCDNR and Charles River Laboratories for violating the Endangered Species Act over the practice of detaining horseshoe crabs in containment ponds.



the majority of crabs are detained, with 75% of all harvested crabs held before bleeding (Kingsley-Smith, 2017).

Only South Carolina allows such plainly unsustainable practices, and SCDNR should forgo possession permits and instead require that harvesters transport crabs for bleeding ***immediately*** after removal.

5. Sever financial ties with Charles River Laboratories.

By leasing Morgan Island, a SCDNR-managed property, to Charles River, in exchange for as much as 20% of the horseshoe crab division's revenue (Eisner, 2021a), an incentive exists to allow unregulated harvesting in South Carolina. SCDNR is expected to receive roughly $1.5 million from Charles River in 2022 alone, with continued options for renewal (Beaufort County, South Carolina, 2017)

Charles River has further ingratiated itself with SCDNR by paying for research, sponsoring NGO conservation events (Eisner, 2022) and funding the agency's educational partners—including the South Carolina Aquarium (Thill, 2017).

Presumably for these reasons, the "horseshoe crab fishery in South Carolina is [considered] a sensitive one" (Kingsley-Smith, 2017, p. 1) that stands apart as uniquely politicized, according to SCDNR researchers (Kingsley-Smith, 2017, p. 1). New SCDNR staff are told to "keep at the front of your mind" internal political dynamics before unfavorably describing biomedical operations (Kingsley-Smith, 2017, p. 1). Implicitly, public acknowledgements of declines are prohibited. Public management decisions are also potentially influenced through corporate offers of cash resources (Eisner, 2022; Flynn, 2021).

SCDNR cannot manage the horseshoe crab fishery in the public interest if it is financially entangled with the industry it is charged with regulating. To address the appearance, if not reality, of impropriety, SCDNR must forego all financial ties (leases, research funding, sponsorships, etc.) with Charles River and pursue funding for the Marine Resources Division through other public mechanisms. Management proposals submitted by Charles River to SCDNR should also be disclosed for public comment in a manner that solicits and welcomes public input.

Conclusion: Commit to Recovery

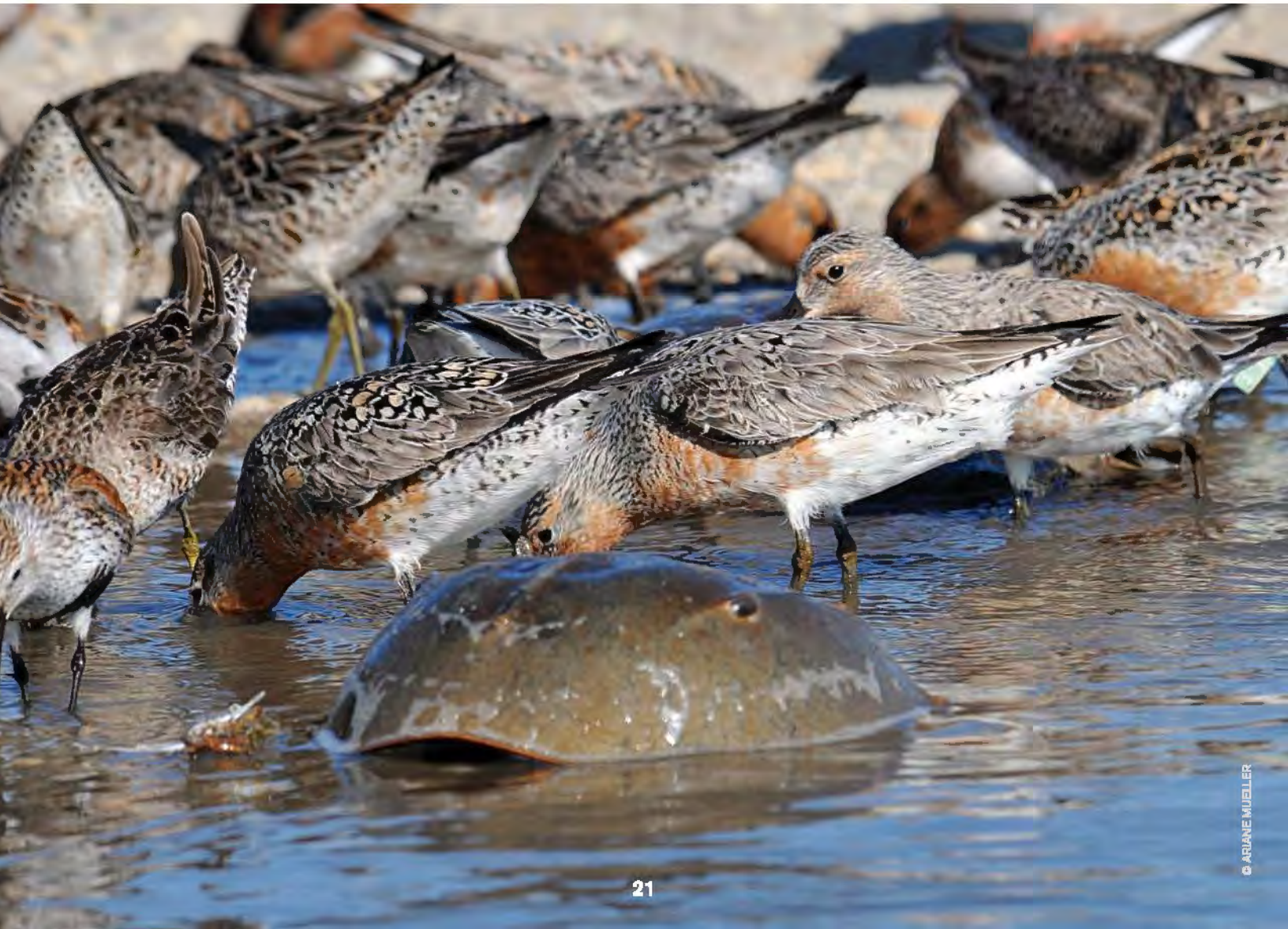
On average, shorebird populations have shrunk by an estimated 70% across North America in the past 50 years, with Arctic-breeding species the most severely diminished (Munro, 2017). Among these species is the rufa red knot, a bird once considered abundantly common in the Lowcountry (Bent, 1928). That abundance, according to USFWS, "remains depleted" (2021c, p. 24).

South Carolina nonetheless remains a critically important stopover. While the management suggestions offered in this report are not exhaustive, they could slow the continued degradation of this vital habitat.

To that end, SCDNR's leadership must impose *enforceable* management restrictions and faithfully enforce them, depoliticize and implement staff suggestions, engage the public in management decisions and uphold legal protections, while establishing distance between the agency and industry.

Most fundamental to this effort is the reconciling of nearly unregulated harvesting and shorebird conservation. By fighting for both, SCDNR staff are burdened with incompatible management goals, the tension of which is manifested on the most studied and high priority habitats.

Without these interventions, the red knot and horseshoe crab are likely to continue their decline, undermining South Carolina's conservation legacy.



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Exhibit L

Review of the Atlantic States Marine Fisheries Commission's (ASMFC) Adaptive Resource Management (ARM) framework for regulating Horseshoe Crab bait harvest in Delaware Bay

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September 2023

This is an expert review of the Atlantic States Marine Fisheries Commission (ASMFC)'s Adaptive Resource Management (ARM) framework – which has been approved for use in managing the Horseshoe Crab fishery in Delaware Bay – performed by Kevin Shoemaker, Ph.D. This document is intended to supplement the review of the ARM completed by Dr. Shoemaker in Fall 2022.

Dr. Shoemaker holds a Ph.D. and an M.S. in Conservation Biology from SUNY-ESF in Syracuse, NY, and a B.S. degree in Biology from Haverford College. He was a Postdoctoral Fellow in the Department of Ecology and Evolution at Stony Brook University and has served as Senior Scientist at Applied Biomathematics, an ecological research and development company located in Setauket, NY. Dr. Shoemaker is currently an Associate Professor at the University of Nevada, Reno, where he uses quantitative models to inform wildlife conservation and management. He has over 15 years of experience as a wildlife ecologist and conservation modeler and has authored over 50 peer-reviewed scientific articles and book chapters on topics in ecology and conservation. He has expertise in Bayesian inference, population ecology, population viability analysis (PVA) and ecological modeling.

OVERVIEW

This report reviews the scientific merits of the Adaptive Resource Management (ARM) framework that has been approved for use by the Atlantic States Marine Fisheries Commission (ASMFC) as a tool for guiding management of the horseshoe crab (HSC) fishery in Delaware Bay and protecting the Federally Threatened *Rufa* Red Knot (*Calidris canutus rufa*; REKN). In Fall 2022

I completed an initial review of the ARM, in which I pointed out five major areas of concern: (1) the fitted relationship linking HSC abundance to REKN survival was functionally insignificant as a driver of REKN population dynamics, (2) the HSC simulation model did not correctly address parameter uncertainty, (3) the statistical model used to estimate HSC demographic processes (Catch Multiple Survey Analysis, or CMSA) exhibited poor fit to the data, (4) the CMSA results were compromised by a 4-year period during which a key source of data was not collected, and (5) the ARM lacked performance benchmarks (null models) to ensure that key model components (e.g., the effect of HSC abundance on REKN survival) meaningfully improved predictive performance versus simpler approaches. The purpose of this follow-up report is to evaluate components of the ARM for which the source code was unavailable for evaluation in my initial review. In particular, I focus on the Integrated Population Model (IPM) approach used by ASMFC for estimating REKN demographic parameters and for quantifying the influence of HSC abundance on the REKN population.

Delaware Bay is a critical stopover site used by REKNs and other shorebirds as they migrate to breeding grounds in the high arctic from their wintering grounds as far south as Tierra del Fuego (USFWS 2021). In particular, HSC eggs deposited on coastal beaches provide a necessary high-calorie food resource for REKNs and other migrating shorebird species as they replenish fat reserves depleted from their long migration and prepare for breeding. At the heart of ASMFC's ARM framework is a set of 'harvest functions' for setting HSC harvest recommendations on the basis of annual estimates of HSC and REKN abundance. In theory, these harvest functions are calibrated to maximize HSC harvest yields while causing minimal risk to the HSC or REKN populations. Optimization of the harvest functions is accomplished by running numerous alternative harvest scenarios using a two-species (HSC and REKN) demographic simulation model and weighing the benefits (harvest) and costs (population risks to HSCs and REKNs) of the simulated outcomes. The cornerstone of this two-species demographic simulation model is a weak (but statistically conclusive) positive effect of female HSC abundance on REKN survival, which serves as a formal, quantitative linkage between the two species. Therefore, the validity of the ARM framework depends upon proper specification of each species' demographic rates (e.g., survival and recruitment) and the degree to which the modeled HSC-REKN interaction

is an appropriate representation of the real-world biotic interaction between these species.

Building on the issues raised in my initial review, this report identifies six additional areas of concern (see below). Based on these concerns, I conclude that the ARM framework is not useful for managing risk to the REKN population due to HSC harvest. Furthermore, my results suggest that the revised ARM misrepresents the importance of HSCs to the REKN population and thereby underestimates both the existential risk to the REKN population posed by female HSC harvest and the potential for promoting REKN recovery through increased regulatory protections and conservation efforts aimed at promoting HSC population increases in the Delaware Bay region. The six primary areas of concern are summarized below, with technical details provided in the "supporting evidence and analyses" section.

(1) **Estimates of REKN survival used in the ARM appear to be artificially inflated, likely resulting in falsely optimistic estimates of population resilience**. The majority of previously reported estimates of annual survival for REKNs and similar shorebirds are in the neighborhood of 80%, corresponding to an average lifespan of approximately five years. In contrast, ASMFC reported a mean annual REKN survival estimate of 0.93, which corresponds to an expected lifespan of nearly 15 years. By nearly tripling the expected REKN lifespan *vis-a-vis* previous estimates, ASMFC is effectively classifying the REKN as a uniquely long-lived species among medium-sized shorebirds. Since individual females must only replace themselves once during their lifetime (on average) for a population to be stable, longer-lived species can afford a higher per-capita failure rate in breeding attempts than shorter-lived species. Therefore, long-lived species are expected to be more resilient to short-term fluctuations in recruitment. However, my findings strongly indicate that ASMFC's estimate of REKN survival is biased high due to the presence of misread errors (by which a flag code is mistaken for a code previously deployed on a different bird). The potential for misread errors in the study system has been previously acknowledged (Tucker et al. 2019). After correcting for potential misread errors, REKN survival estimates fall to approximately 80% annually – a rate more consistent with previous estimates for REKN and similar species. The apparent positive bias in ASMFC's survival estimates is likely to result in falsely optimistic estimates of population resilience to short-term environmental fluctuations, raising

concerns about the adequacy of the ARM framework for assessing population-level risks to this federally Threatened species.

(2) **Trawl-based indices of HSC abundance are inadequate for detecting robust links to REKN demography**. ASMFC documented a very weak (and not ecologically meaningful; see attachment) positive effect of female HSC abundance on REKN survival. This relationship is the cornerstone of the revised ARM framework, as it represents the primary functional link between the two focal species. The effect of HSC abundance on REKN survival was estimated using the output from a Catch Multiple Survey Analysis (CMSA) as a proxy for annual HSC abundance in Delaware Bay. The CMSA in turn was trained using data from three trawl-based surveys, conducted by Virginia Tech, New Jersey, and Delaware, respectively (in addition to data on known sources of HSC mortality). However, my reanalysis of the available data uncovered no conclusive relationship between REKN survival and any trawl-based index of HSC abundance. Notably, after including several additional years of REKN mark/resight data (I used REKN banding and resighting data from 2003 through 2022, whereas ASMFC's used data from 2005 to 2018), the effect of HSC abundance on REKN survival became negative (lower REKN survival with more female HSCs) when using the code and data provided by ASMFC. This result underscores the frailty of the foundational relationship on which ASMFC's two-species ARM is based. Trawl-based surveys are necessarily imperfect snapshots of the abundance of HSCs occupying Delaware Bay, obscured by differing survey methodologies and poorly understood aspects of HSC ecology, including seasonal and daily activities, habitat preferences, and degree of clustering on the seafloor. Moreover, the functional link between HSC abundance and REKN demographic rates is eroded by additional, poorly understood processes that govern the availability of HSC eggs for shorebirds, including variation in the timing of HSC egg deposition and the factors that dislodge eggs from their clusters, rendering them accessible to shorebirds. Therefore, the lack of a demonstrable effect of trawl-based HSC indices on REKN vital rates likely reflects the weakness of these indices and not the weakness of the underlying biotic interaction.

(3) **REKN survival is strongly sensitive to HSC egg-density, indicating that persistent**

degradation of the HSC egg resource could have dire consequences for the REKN population. Intuitively, surveys of HSC egg densities measured on the same beaches used by foraging shorebirds during their spring migration should more directly capture the biotic interaction between these two species. Although researchers have been consistently measuring the surface density of HSC eggs at multiple beaches across Delaware Bay (NJ side only) since 2000, ASMFC chose to rely on trawl-based surveys instead of egg-density surveys as a proxy for the HSC resource available to REKNs. My reanalysis of the Delaware Bay mark-resight database indicates that REKN survival is strongly and positively influenced by annual fluctuations in HSC egg density. Unlike the weak relationship documented in the ARM, the fitted relationship between HSC egg-density and REKN survival implies severe risks to the REKN population under a scenario of sustained low HSC egg densities. In contrast to ASMFC's two-species ARM, this alternative characterization of the HSC-REKN interaction is capable of explaining the observed decline in REKN populations during the late 20th century, which is widely attributed to unregulated harvest of HSCs in Delaware Bay. These new results strongly suggest that ASMFC's ARM framework misrepresents the importance of HSCs to the REKN population. As a result, the ARM not only severely underestimates the consequences of HSC population declines on the REKN population, but it severely underestimates the critical role that a rebound of the HSC population could play in the recovery of this federally Threatened species.

(4) **The ARM exaggerates the evidence for an increasing trend in the number of female HSCs in Delaware Bay.** Based on my reanalysis, neither the trawl-based surveys used by ASMFC nor the egg-density surveys (recently used to document an increasing trend in the HSC population) show strong evidence for increasing abundance of female HSCs in Delaware Bay over the last 20 years. As a case in point, the raw data (catch-per-unit-effort; CPUE) from New Jersey's ocean trawl survey (one of the data sources used by ASMFC for documenting a positive trend in HSC abundance) appears to indicate increasing female HSC abundance over time (statistically significant at alpha=0.05); however, when the raw CPUE numbers are adjusted for strong effects of seasonality, water temperature, depth and dissolved oxygen on HSC captures in Delaware Bay (NJ ocean trawl survey), the apparent positive trend in

HSC CPUE becomes inconclusive. Notably, the trawl-based indices used by ASMFC in their CMSA model did not control for these confounding factors. Therefore, the increasing trend in the HSC population reported by ASMFC and used in the ARM may be an artifact of differing survey conditions (e.g., differences in trawl depth or water temperature) rather than evidence of recovery of the HSC population over time. Furthermore, regression models combining the CPUE estimates (both adjusted and unadjusted) from all three trawl-based surveys showed no conclusive evidence for a trend in HSC abundance over time. Similarly, when the egg-density data were adjusted for known differences in survey methodologies, the apparent positive trend (reported in Smith et al. 2022) became inconclusive (note that this adjustment did not impact the estimated relationship between REKN survival and HSC egg-densities). Overall, my reanalysis suggests that the ARM framework exaggerates the potential for recovery of the female HSC population under present conditions, and thereby likely underestimates the risk of harvest to the HSC (and REKN) populations in Delaware Bay.

(5) **The statistical model (IPM) used for estimating REKN population parameters is over-parameterized and likely to yield spurious results**. The IPM framework used to train the REKN population model comprises two integrated sub-models: (1) a "state-space" model for estimating abundance and recruitment on the basis of population counts over time, and (2) a "capture-recapture" model for estimating survival rates from observation records of uniquely marked individuals. Whereas the data available for fitting the capture-recapture model (over 100,000 resighting records of tens of thousands of unique REKN individuals) was information-rich and well-suited for training complex models, the data available for training the state-space model was sparse by any standard, comprising 14 unique data points (one count per year from 2005 to 2018). In fact, the number of parameters estimated in the state-space model appears to exceed the number of data points. As an analogy, consider a parachute whose canopy is attached to its user with suspension cords. A minimum of three cords is necessary for the parachute to have any chance of operating correctly, yet many more cords are typically incorporated to ensure robust performance. Similarly, a free parameter (an "unknown") must be tethered to the truth using data points

as suspension cords. A model's claim to truth strengthens as the ratio of data points to free parameters increases; statisticians often recommend a ratio exceeding 30 or more for robust model performance. With less than 1 data point per parameter, the IPM's state-space model is occupying a danger zone statisticians refer to as "over-parameterization", or "over-fitting". Over-parameterized models have a strong tendency to produce spurious results (results that fail to replicate when confronted with new data). To confirm the tendency of the REKN IPM to yield spurious results, I generated artificial REKN count data under a model with no underlying trend (a white-noise process) and assessed how often the IPM erroneously detected a trend. After running 50 replicates (iteratively replacing the peak-count data with newly simulated white-noise), the IPM falsely detected an ecologically meaningful temporal trend (increase or decline in abundance over time) over 80% of the time. Among the unknown quantities estimated from the 14 peak-count data points are several terms critical for understanding and forecasting REKN population dynamics, including initial abundance, population trends (growth or decline), mean recruitment, and the effect of HSC abundance on recruitment. Lacking sufficient data for parameter estimation, the REKN recruitment and population trend estimates used in the ARM model are more likely to reflect random noise in the peak count data rather than the demographic reality of the REKN population. Therefore, the REKN demographic simulations used in the ARM should not be considered a robust representation of the real-world population of *Rufa* Red Knots that uses Delaware Bay each year.

(6) **The IPM exhibits poor fit to the observed REKN data**. Goodness-of-fit (GOF) testing is a critical validation step in any model-fitting workflow, ensuring that key assumptions made during the modeling process are reasonable and justified. For example, the results from a linear regression or ANOVA test can only be interpreted once the analyst confirms that important assumptions are satisfied (e.g., that model residuals are approximately normally distributed). Although the REKN IPM is much more complex than a linear regression model, assessing goodness-of-fit is no less important. In the context of hierarchical Bayesian analysis (the paradigm used by ASMFC to fit the REKN IPM), a commonly used approach is to run a Posterior Predictive Check (PPC), in which data are repeatedly simulated under the

fitted model and compared to the actual data. If a model is unable to generate data resembling what was actually observed, the model is determined to be an inadequate representation of the true processes that generated the data. In their ARM report, ASMFC mentions (but does not further document) two PPCs that were performed to assess goodness-of-fit. One of these tests – the only test included in the publicly shared IPM code – uses a PPC to assess the degree to which the state-space model adequately represented the 14 peak-count data points. However, this test has been shown to be an insufficient gauge of model adequacy. The second and final goodness-of-fit test mentioned in the ARM report (for which the result suggests moderate lack of fit) is absent from the version of the IPM code shared publicly, so it is not possible to assess what test was actually run. However, I ran three additional PPCs to assess the degree to which the IPM adequately represented the REKN resighting data from 2003 to 2022. These tests, which were applied and reported in an earlier version of the open-robust-design (ORD) model for estimating REKN survival and stopover use (Tucker et al. 2021), indicated poor fit to the data, suggesting that the IPM is an inadequate representation of key processes operating in the REKN population – including survival. The failure of the IPM to pass rigorous goodness-of-fit tests casts additional doubts on the conclusions generated from this model.

SUPPORTING EVIDENCE AND ANALYSES

The remainder of this report supplies supporting details for the six major areas of concern identified above, including results and figures from re-analyses of the data presented in the ARM report. I report additional findings in the "supplemental analyses" section located at the end of this report.

1. Estimates of REKN survival used in the ARM appear to be artificially inflated, resulting in falsely optimistic estimates of population resilience

The majority of published survival estimates for REKNs and other medium-sized shorebirds indicate a mean annual survival of approximately 80% (Baker et al. 2004; Piersma et al. 2016; Mendez et al. 2018), corresponding to an expected lifespan of approximately five years. In contrast, ASMFC reported a mean adult REKN survival rate of 0.93 on the basis of the REKN IPM,

corresponding to an expected lifespan of nearly 15 years. By nearly tripling the expected REKN lifespan (versus previous estimates), ASMFC is effectively classifying the REKN as a longer-lived species than other similar-sized shorebirds (Mendez et al. 2018). Since a stable population requires only that individual females replace themselves once during their lifetime, longer-lived species can afford to fail in more of their breeding attempts than shorter-lived species. Therefore, longer-lived species are expected to be more resilient to short-term fluctuations in breeding success and juvenile survival than species with a shorter lifespan (Lovich et al. 2015). ASMFC argues that their characterization of the REKN life history is accurate, and that previously reported estimates may be biased low (ASMFC 2021). In contrast, my findings strongly indicate that ASMFC's estimate of REKN survival is biased high, most likely due to the presence of misread errors in the REKN resighting database.

The presence of potential misread errors in the study system has been previously acknowledged (Tucker et al. 2019). Studies with simulated and real-world data have shown that misread errors can induce biases in survival estimates (Tucker et al. 2019; Rakhimberdiev et al. 2022). Because the data used to fit the REKN IPM was adjusted for one type of potential misread error (i.e., any observed flag codes that were never deployed in Delaware Bay were discarded), the only type of misread error that ASMFC did not account for was the possibility that a flag code was mistaken in the field for a different previously deployed code (effectively ascribing that observation to a bird that may no longer be alive). This type of misread error (if present in sufficient numbers) is known to falsely inflate survival, especially for the early years of a long-term mark-resight study (Tucker et al. 2019). Tucker et al. (2019) showed that this source of bias can be corrected by discarding observations for which a flag code was sighted only once (i.e., by a single observer during a single sampling occasion) in a given season. Although this technique necessarily discards some correct observations (only a fraction of these 'singlet' observations are likely to be in error) and thereby reduces the precision of the resulting estimates (Tucker et al. 2019; Rakhimberdiev et al. 2022), Tucker et al. (2019) demonstrated that this method was effective in removing biases induced by this class of misread error. Furthermore, Tucker et al. (2019) demonstrated that, when applied to the flag-resighting data from Delaware Bay, REKN survival estimates from early in the study period dropped from 87% to 81%, suggesting that

these survival estimates were artificially inflated due to misread errors.

The number of leg-flag codes that can be manufactured is necessarily limited by the number and type of symbols and colors used. Notably, given the very large number of leg flags that have been deployed on REKNs in Delaware Bay since 2003, shorebird biologists have cycled through all possible flag code permutations for the flag color (lime green) most commonly deployed in Delaware Bay. Therefore, any leg-flag codes that are read or transcribed in error are more likely to be falsely attributed to a different bird in the database than to be discarded (as it would be if there were no match in the database). Furthermore, the risk of this type of error is likely to increase substantially as the years pass and as a greater fraction of flag code permutations are deployed in the field. Coupled with the fact that longer time series are likely to manifest increasingly strong biases due to misread errors (Tucker et al. 2019) the risk of biased survival estimates and spurious trends is likely to increase markedly as the database continues to grow (e.g., in future iterations of the ARM model if potential misread errors continue to be ignored).

To assess whether ASMFC's survival estimates were biased due to the inclusion of misread errors, I used REKN banding and resighting data from Delaware Bay to estimate annual REKN survival using two different statistical frameworks: Cormack-Jolly-Seber (CJS; a standard approach to survival estimation using capture-recapture data) and the open-robust-design (ORD) framework for survival estimation used by ASMFC. First, I ran standard CJS models to estimate annual survival rates as a function of the banding data only (Cooch 2008) (i.e., ignoring all flag-resighting data). This model generated separate estimates of survival and detection probability for each year, and included additional terms for transience and 'trap-response' (Pradel and Sanz-Aguilar 2012). The banding data were much less information-rich than the re-sighting observations, with far fewer observations and a much lower re-capture rate. However, misread errors should be virtually absent from the banding records (as captured birds can be examined at close range). I trained this model (and all models presented in this section) using Markov Chain Monte Carlo (MCMC) in a Bayesian framework using JAGS (Plummer 2012), which was called from R using 'JagsUI' (Kellner et al. 2019). The 'band-only' models yielded an estimated mean annual REKN survival of 79% (Fig. 1). Based on a posterior predictive check (PPC), the Bayesian p-

value for this model was 0.1, indicating reasonable fit, with the observed data slightly over-dispersed relative to the fitted model (Fig. 1).

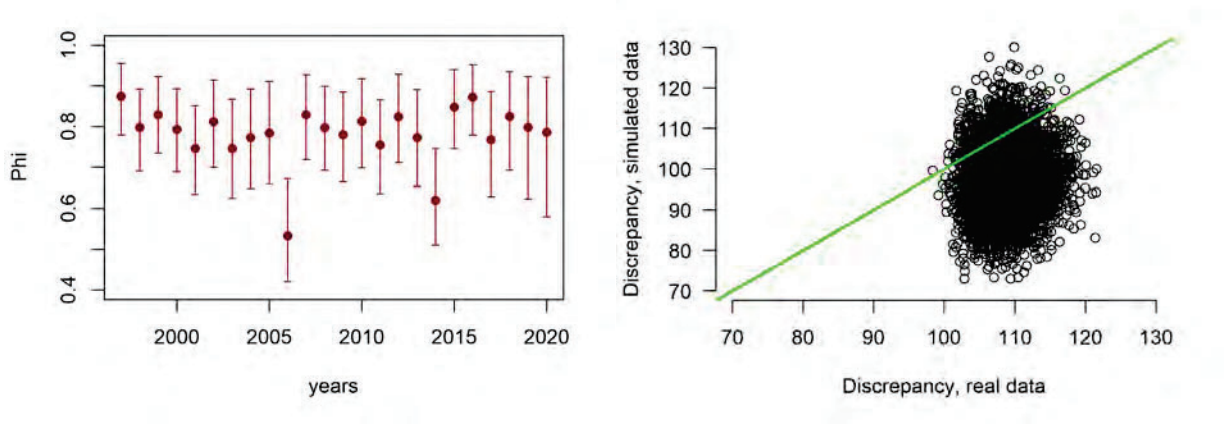


Figure 1*. Left: mean annual (apparent) REKN survival (y axis) based only on banding data (no resighting data) from Delaware Bay from 1997 to 2022, using a Bayesian CJS model. Mean estimated apparent survival was 0.79, much lower than ASMFC's estimate of 0.93. Apparent survival (Phi) is a compound parameter indicating the probability of surviving and remaining within the study area. This model accounts for the presence of transients, which can bias survival estimates low. Right: Goodness-of-fit plot for the Bayesian CJS model using only banding data from Delaware Bay. This model exhibited reasonable fit to the data, with a Bayesian p-value of 0.1.*

Next, I fitted CJS models that incorporated the resighting data along with the banding data. When potential misread errors (flag codes observed only once by a single observer in a given season) were retained for analysis, mean apparent survival across all years was ~88%, with a steady decline in survival observed over the period from approximately 2005 to 2015 (Fig. 2). When potential misread errors were removed, mean REKN survival estimates dropped to ~80% annually – a rate more consistent with previous estimates for REKNs and other similar-sized shorebirds (Fig. 2). After correcting for potential misread errors, no temporal trend in survival was apparent across the study period (Fig. 2). This pattern is consistent with the known effects of misread errors, which tend to induce a spurious negative trend in survival (more positively biased estimates going further back in time) for long-term studies (Tucker et al. 2019).

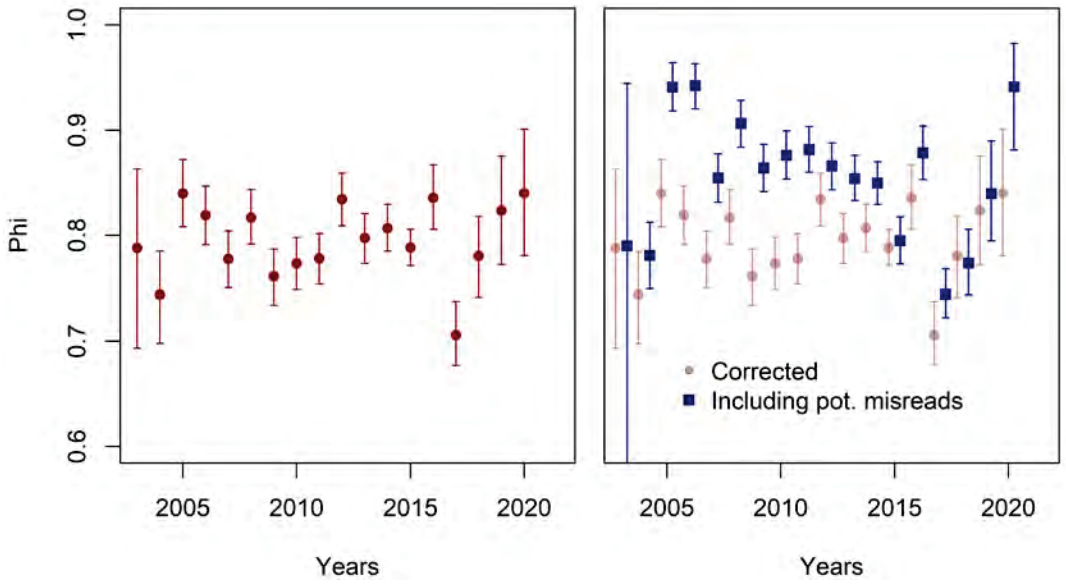


***Figure 2**. Left: REKN annual apparent survival estimates (Phi; error bars indicate Bayesian 95% credible intervals) based on banding and resighting records from Delaware Bay, using a Bayesian CJS model with inter-annual process variance in survival, accounting for potential transients and 'trap response' (whereby individuals are more likely to be resighted if they were resighted in the previous year). This analysis uses only birds first banded in Delaware Bay (resighting observations of birds first captured elsewhere were discarded prior to analysis, following ASMFC 2021). To correct for misread errors, only birds resighted more than once in a particular year were considered to have been resighted that year. After correcting for potential misread errors, the estimated average apparent survival (Phi) was 0.80 annually, much lower than ASMFC's estimate of 0.93. Right: Comparison of REKN apparent survival with potential misreads (blue squares, including individuals resighted only once in a given year) versus the corrected version of the data with single-resight observations removed (transparent red; same results reported in left panel). As noted by Tucker et al. (2019), misread errors are more likely to bias survival estimates high in the early years of long time series- we see this effect here, especially in the period from 2005 to 2015.*

Finally, I used ASMFC's open robust design (ORD) framework to estimate annual REKN survival rates. This model, described by Tucker et al. (2022), is capable of estimating survival in addition to temporary emigration and the timing of arrival and departure from the stopover site

each year. When potential misread errors are retained in the data set, the ORD model indicated a mean REKN survival rate of 0.9 (somewhat lower than ASMFC's estimate of 0.93, but similar to the survival rate reported in Tucker et al. 2022), with survival rates generally declining across the study period, as expected for data sets with misread errors (Tucker et al. 2019) (Fig 3). When potential misread errors were removed following the methods of Tucker et al. (2019), mean apparent survival rates dropped to ~80% or below throughout most of the 20-year study period, with no apparent trend over time (Fig. 3).

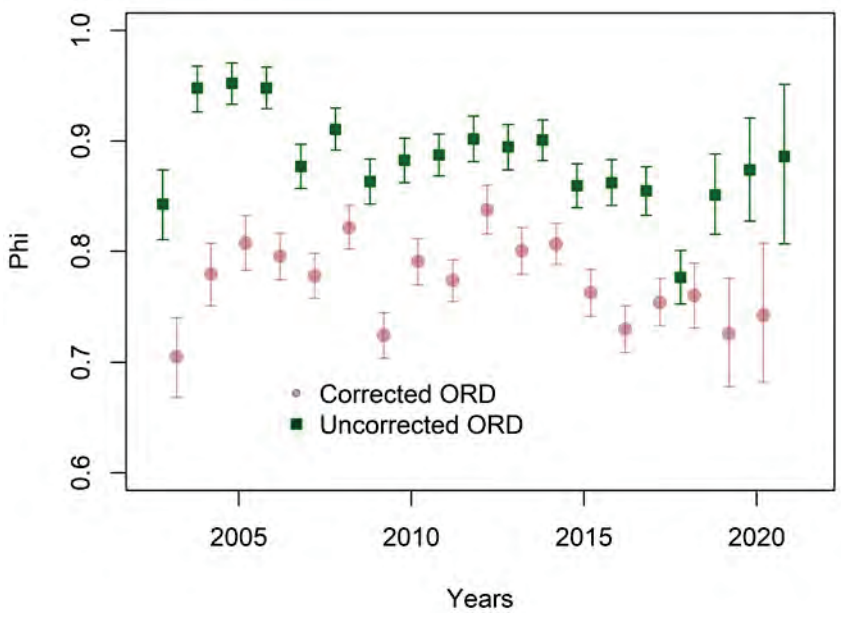


Figure 3*. Annual apparent survival (phi; y axis) estimates from the open robust design (ORD) model used by ASMFC, fitted to REKN banding and resighting data from Delaware Bay from 2003 to 2022. Red circles and confidence intervals represent estimates from the model after correction for potential misread errors (i.e., by removing instances in which a REKN was re-sighted only once in a season). Estimated survival from the uncorrected ORD model (green squares; without correction for potential misread errors) are nearly always substantially higher than the corresponding estimates after accounting for potential misread errors. In addition, the uncorrected time series (green squares) displays the characteristic (spurious) negative trend in survival typically associated with survival estimates from long time series that include misread errors (Tucker et al 2019).*

Overall, these tests strongly indicate that the REKN survival rates used by ASMFC's ARM framework are artificially inflated and do not accurately reflect the real-world population of *Rufa* Red Knots. This artificially exaggerated longevity is likely to result in falsely optimistic estimates of REKN population resilience to short-term environmental fluctuations. In reality, the REKN population is likely to be much more vulnerable to one or two bad breeding years than the ARM model would suggest. The misspecification of the REKN demographic model raises serious concerns about the adequacy of the ARM framework for assessing population-level risks to this federally protected species.

2. Trawl-based indices of HSC abundance are inadequate for modeling the biotic interaction between REKNs and HSCs

ASMFC's IPM indicated a weak (and not ecologically meaningful; see attachment) positive effect of female HSC abundance on REKN survival. This relationship is in many ways the cornerstone of the ARM framework, as it represents the primary functional interaction between the two focal species. In the IPM, the effect of HSC abundance on REKN survival was trained using output from a Catch Multiple Survey Analysis (CMSA) as a proxy for female HSC abundance in Delaware Bay. In the CMSA, the HSC population was estimated on the basis of data from three trawl-based surveys (in addition to known sources of HSC mortality), conducted by Virginia Polytechnic Institute and State University (VT), New Jersey (NJ), and Delaware (DE), respectively.

I was able to obtain the survey records from each of the three Delaware Bay trawl surveys for reanalysis up to and including data from 2022. For my reanalysis, I only analyzed data on female HSCs due to their unique importance for REKNs. For each trawl survey, I generated a 'raw' annual catch-per-unit-effort (CPUE; often used as an indicator of abundance) by dividing the total number of female HSC captures by the total survey effort (generally reported as the length of seafloor surveyed). However, raw CPUE values do not control for other factors that can affect the number of expected HSC captures, such as time of year (seasonality), water temperature, salinity, depth, and dissolved oxygen. Therefore, comparing raw CPUE estimates across years can be misleading if (for example) the surveys were conducted at different seasons, or under disparate water temperatures or depths. To control for these unwanted effects, I used

generalized linear models (GLM) and generalized additive models (GAMs) to model the number of female HSCs captured in each trawl survey as a function of seasonality (Julian date), water temperature, dissolved oxygen, salinity, and depth, using an offset term to account for differences in survey effort (tow length) among surveys (e.g., Fig. 10). Nonlinear responses were accommodated with quadratic terms or spline fits. All models assumed a negative binomial error distribution and a log-link. Models were fitted in R using the package 'glmmTMB' (Brooks et al. 2017), with goodness-of-fit assessed using the 'DHARMa' package (Hartig and Hartig 2017).

In my reanalysis I attempted to replicate the biotic interaction reported by ASMFC using trawl-based indices of female HSC abundance. Specifically, I used the REKN banding and resighting records from 2003 to 2022 (including 6 years of additional data relative to the ASMFC model, which only used data from 2005 to 2018) to model REKN apparent survival as a function of HSC several trawl-based indices of HSC abundance: (1) the CMSA results reported by ASMFC, (2) raw (unadjusted) and adjusted indices of HSC abundance from the DE, NJ and VT trawl surveys, and (3) design-based estimates of HSC abundance derived from the VT trawl survey (Wong et al 2022). In my reanalysis, I used conventional capture-recapture methods (Cormack-Jolly-Seber; CJS) in addition to the open-robust-design (ORD) framework used by ASMFC to estimate the effect of these indices on REKN survival.

Despite running multiple analyses with alternative trawl-based indices, my reanalysis efforts have uncovered no conclusive link between REKN survival and any trawl-based index of HSC abundance (including the CMSA-based indices used by ASMFC) (Table 1). Neither classical capture recapture methods (CJS) nor ASMFC's ORD method yielded evidence for a positive HSC-REKN relationship. Notably, the model that most closely resembled ASMFC's model – using the ORD framework for parameter estimation and the CMSA results as a proxy for HSC abundance – indicated a statistically significant *negative* effect of HSC abundance on REKN survival (Table 1). This surprising result is likely to be a spurious correlation, and should not be interpreted to suggest that higher HSC abundance in Delaware Bay leads to lower REKN survival (higher mortality). Critically, this result demonstrates that ASMFC's documented relationship between REKN survival and HSC abundance (upon which this two-species ARM framework is based) is unstable, underscoring the tenuousness and uncertainty of this critical relationship. Interestingly,

this relationship could not be replicated even after (1) using the ORD parameter estimation framework and the code provided by the ASMFC modelers (2) reducing the dataset to cover the same period analyzed by ASMFC (2005 through 2018), (3) using the same CMSA-based estimates of female HSC abundance used by ASMFC, and (4) including the other time-varying covariates used in the ASMFC model (arctic snow cover and spawn timing). The instability of the HSC-REKN relationship reported by ASMFC suggests both that it is unlikely to be meaningful reflection of reality and that it is a poor foundation upon which to base a two-species risk assessment framework.

***Table 1**. Tests of alternative HSC abundance indices as drivers of REKN survival. Gray shading reflects non-significant results (95% CI overlaps zero, suggesting coefficient could plausibly be positive or negative), green shading reflects significant positive coefficients (more HSC implies higher REKN survival), light green shading represents weakly (marginally) significant positive coefficients, and red shading reflects significant negative coefficients (more HSC implies lower REKN survival).*

HSC Abundance index	**HSC survey type**	**Survival coef, CJS**	**Survival coef, ORD**
CMSA (uses DE, NJ and VT), 2005-2018	Ocean Trawl	0.02 (-0.18 to 0.22)	-0.18 (-0.31 to -0.06)
Virginia Tech (VT), abundance estimate	Ocean Trawl	-0.03 (-0.21 to 0.23)	-0.24 (-0.45 to 0.00)
Virginia Tech, CPUE	Ocean Trawl	0.23 (-0.01 to 0.54)*	-0.19 (-0.37 to -0.02)
Virginia Tech, CPUE adjusted	Ocean Trawl	0.01 (-0.18 to 0.18)	0.08 (-0.12 to 0.26)
DE trawl, CPUE**	Ocean Trawl	0.01 (-0.14 to 0.18)	-0.14 (-0.31 to 0.04)
DE trawl, CPUE adjusted**	Ocean Trawl	-0.02 (-0.17 to 0.17)	-0.10 (-0.27 to 0.09)

NJ trawl, CPUE	Ocean Trawl	-0.05 (-0.31 to 0.15)	-0.16 (-0.32 to 0.10)
NJ trawl, CPUE, adjusted	Ocean Trawl	-0.07 (-0.28 to 0.09)	0.09 (-0.16 to 0.28)
Delaware Bay Spawning Survey	Beach survey	0.02 (-0.18 to 0.27)	-0.09 (-0.26 to 0.12)
NJ Surface Egg Density	Beach survey	-0.08 (-0.24 to 0.06)	-0.09 (-0.29 to 0.09)
NJ Surface Egg Density (NJ REKN data only)***	Beach survey	0.29 (0.07 to 0.52)	0.32 (0.01 to 0.58)

*This relationship has weak statistical support but could be interpreted as evidence for a positive effect of HSC abundance on REKN survival.

*** Data provided on Aug 10, 2023. This work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife

*** This analysis used REKN capture and recapture records from the NJ side of the bay, since surface egg density was only collected on the NJ side of the bay.

The lack of a demonstrable effect of trawl-based HSC indices on REKN survival (Table 1) likely reflects the weaknesses of these indices rather than the weakness of the underlying biotic interaction. Trawl-based surveys are highly imperfect snapshots of the population of HSCs inhabiting Delaware Bay, obscured by differing survey methodologies and poorly understood aspects of HSC ecology, including seasonal and daily activities, habitat preferences, and degree of clustering on the seafloor. Furthermore, trawl-based surveys ignore that REKNs and other shorebirds do not feed on HSCs directly, but instead use their eggs to fuel their northward migration; therefore, the utility of trawl-based indices may be further eroded as a useful metric by additional, poorly understood processes such as annual variation in the timing of HSC egg deposition and the processes that dislodge eggs from their clusters and thereby render the eggs accessible to shorebirds.

To assess the degree to which the Delaware Bay trawl survey results reflected signal

about true annual fluctuations in HSC abundance versus random noise (likely driven by unmodeled variations in survey conditions, HSC clustering and seasonal movements and other poorly understood aspects of HSC ecology), I tested for pairwise correlations of the raw and adjusted CPUE estimates. Pearson correlations among the raw and adjusted CPUE results ranged from 0 to 0.45 (Fig. 4). The only statistically significant correlation among the three surveys was between the unadjusted CPUE estimates for the NJ and DE trawl surveys. However, this relationship weakened to 0.16 and became inconclusive after controlling for seasonality and site conditions (Fig. 4). Overall, the correlation tests indicated that the results from the three trawl surveys are largely uncorrelated with one another (Fig. 4). Therefore, it is likely that the trawl survey results (and the resulting indices and estimates of HSC abundance) largely reflect factors unrelated to variation in the underlying HSC population.

If annual trawl-based estimates (and estimates derived from these surveys, like the CMSA) are largely uncorrelated with the underlying dynamics of the HSC population, REKN survival could conceivably be strongly correlated with true HSC abundance yet show little correlation with trawl-based HSC indices (Table 1). In this way, the use of trawl-based indices as a proxy for HSC abundance (e.g., in models of REKN survival) may severely misrepresent the true nature of the interaction between these two species. Overall, the results of my reanalysis indicate that trawl-based indices of HSC abundance are a noisy and unreliable indicator of annual fluctuations in the HSC population, and are likely an inadequate metric for quantifying the biotic interaction between REKNs and HSCs in Delaware Bay.

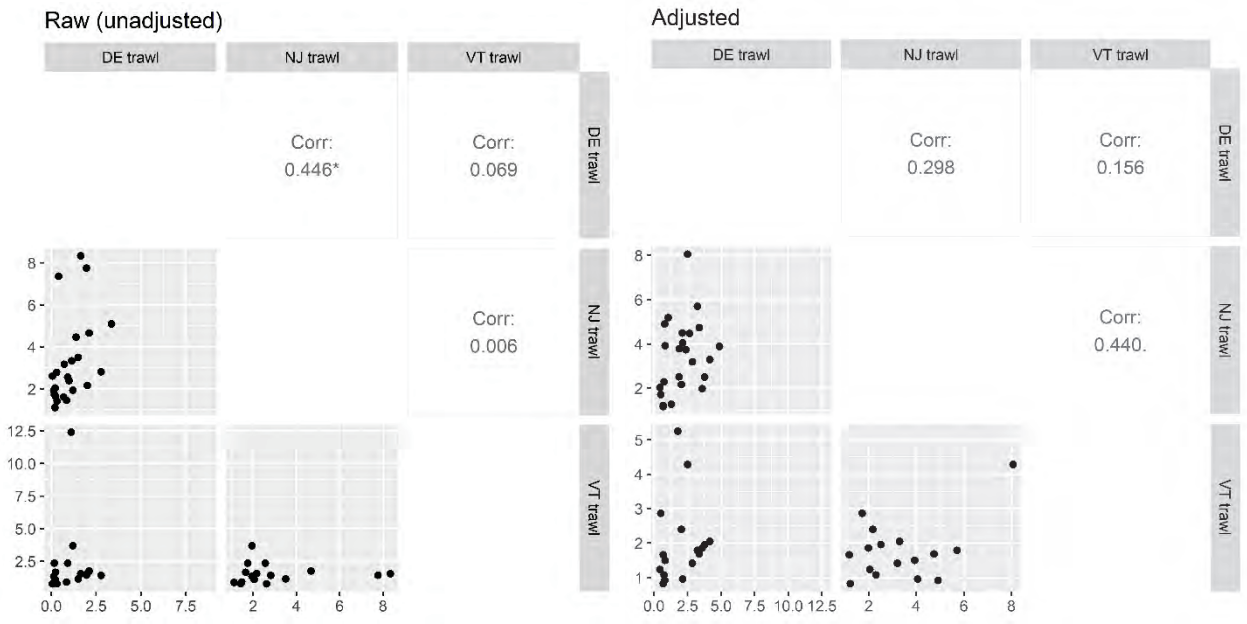


Figure 4*. Scatterplot matrices (lower diagonals) and Pearson correlation tests (upper diagonals) for raw (left) and adjusted (right) catch-per-unit-effort (CPUE; HSC abundance indices) from three trawl-based surveys conducted in the Delaware Bay area from 1990 to 2022. Pearson correlations among the different trawl surveys ranged from 0 to 0.45. The only statistically significant correlation among the three surveys was between the unadjusted CPUE estimates for the NJ and DE trawl surveys. This relationship weakened to 0.16 after controlling for seasonality and site conditions. DE trawl data were provided on Aug 10, 2023. This work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife. Note that fulfillment of data requests does not constitute endorsement by the NJ Marine Resources Administration of any analyses or end products derived from the requested data.*

3. REKN survival is strongly sensitive to HSC egg-density, indicating that persistent degradation of the HSC egg resource could have dire consequences for the REKN population

In contrast to trawl-based HSC survey data, surveys of HSC egg densities measured directly on the beaches used by REKNs and other shorebirds are likely to be a far more direct representation of the functional ecological link between these two species. Fortunately, such data are available: researchers have been consistently measuring the shallow-depth (0 to 5 cm)

density of HSC eggs in Delaware Bay (NJ side only) since 2000. While beach surveys (like all ecological data) are subject to sources of error that can obscure underlying signals, there are far fewer intermediate processes that may compromise the signal of the ecological relationship between these species. Although HSC egg surveys and spawning counts have been conducted in Delaware Bay for many years, ASMFC chose to use trawl-based surveys instead of surface egg density surveys to represent the HSC resource available to REKNs in their models (although they also used information on the timing of HSC spawning). To explain this decision, ASMFC has stated (1) that HSC abundance in Delaware Bay (CMSA model and results) has a clearer nexus with their management directive (ASMFC manages the HSC stock rather than the density of eggs deposited on beaches), and (2) that the egg data are highly variable across both space and time (seemingly making a case, without strong evidence, that the surface egg density surveys may be unreliable). Whatever their rationale for ignoring the long-term surveys of HSC surface egg-densities, it is misguided if it misrepresents the true nature of the underlying biotic interaction.

To evaluate the HSC surface egg density data as a proxy for the HSC egg resource available to migrating REKNs, I first reanalyzed the raw data to ensure that comparisons were valid across years for which survey methodologies differed. Overall, three different survey methodologies were used for measuring surface egg density during the period from 2000 to 2023. Although egg densities were always measured in the top 5 cm of the surface, the total area of beach surface measured per sample differed substantially among survey periods. To correct for these differences (effectively putting all samples on an even playing field) I used a modified version of the methods described in Smith et al. (2022) that included an offset term in the linear model formula. Briefly, I used generalized additive mixed models (GAMM) to model the number of eggs counted in each sample as a function of year (fixed effect) and seasonality (Julian day, using a smoothing spline to accommodate a non-linear functional response), with a random intercept term to accommodate for among-site variation, using an offset term (log of surface area sampled) to account for differences in survey effort (surveyed area) among samples. Following Smith et al. (2022), I assumed a negative binomial error distribution and a log link. Also following Smith et al. (2022), models were fitted in R, using the package 'glmmTMB' (Brooks et al. 2017), with goodness-of-fit assessed using the 'DHARMa' package (Hartig and Hartig 2017).

To assess the annual estimates of HSC surface egg density as a proxy for HSC egg resource availability in the REKN survival models, I used the annual adjusted surface egg density estimates as a covariate in the CJS and CMSA models. Since the HSC egg data were only collected on the NJ side of the bay, I only used REKN banding and resighting data from NJ for this analysis. The results of this analysis indicated a strong, positive effect of HSC density on REKN survival (Fig. 5). Years with high HSC egg densities were associated with mean REKN survival rates approaching 85%, whereas survival was reduced to approximately 65% in years with low HSC egg densities. Although these results were based on a standard Cormack-Jolly-Seber model for survival estimation, the open-robust-design model used by ASMFC yielded similar results, although with a wider range of parameter uncertainty (Table 1, section 2).

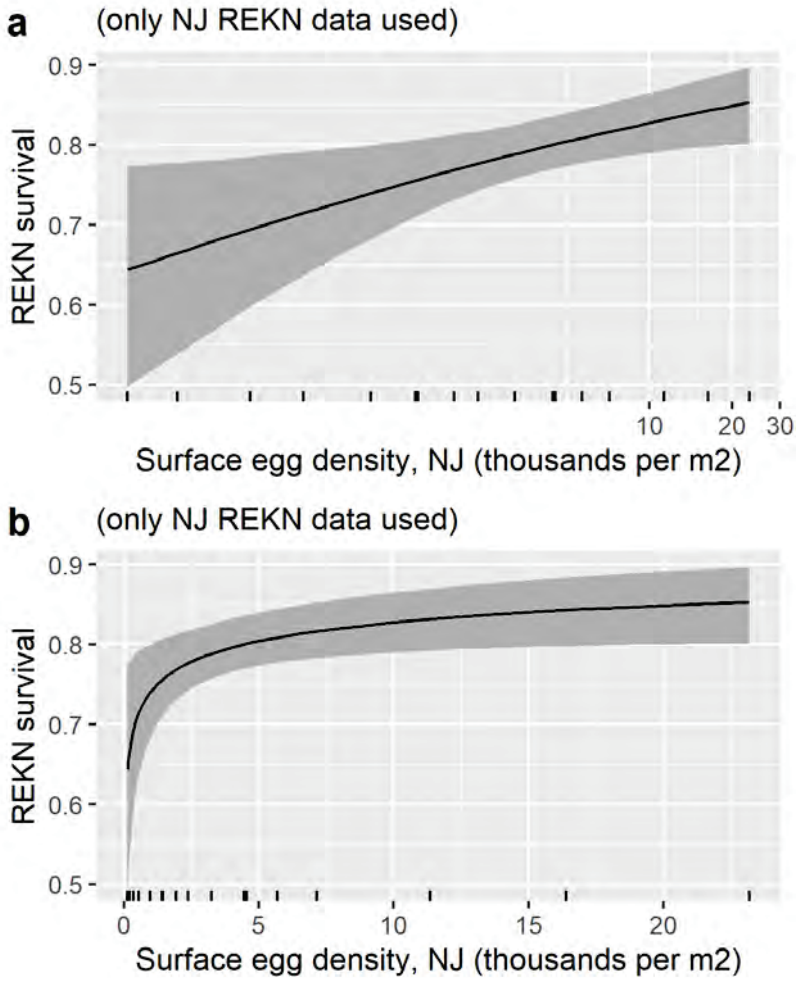


Figure 5*. REKN survival as a function of the observed surface density of HSC eggs (thousands of eggs per m2, top 5 cm) on the NJ side of Delaware Bay. The top panel shows this relationship on the log scale (the scale at which the relationship was modeled), and the bottom panel shows the same relationship on the raw, untransformed scale. These results are derived from a Cormack-Jolly-Seber (CJS) model fitted to REKN banding and resighting data from 2003 to 2022. The rug (additional tick-marks along the x-axis) represents the observed egg densities during the study period. Since egg density data was not collected on the DE side of Delaware Bay, only birds resighted in NJ were used for this analysis.*

In contrast to the HSC-REKN relationship used by ASMFC, under which the REKN population would be expected to increase even under the complete elimination of the HSC population in Delaware Bay (see attached), the effect of HSC egg density on REKN survival (Fig. 6)

forecasted a steep decline in the REKN population under sustained low densities of HSC eggs (held constant at the lowest observed levels from 2000 to 2022), resulting in near-extinction of the REKN population after 2-3 decades (Fig. 6). The magnitude of this relationship suggests that even 5 years of low HSC egg densities could result in a 50% decline of the REKN population. The strength of the estimated relationship between HSC egg densities with REKN survival is much more consistent (in comparison with the ARM framework) with the observed decline in the REKN population during the late 20th century, which is widely attributed to unregulated HSC harvest. Also in sharp contrast to the ASMFC model, the estimated relationship between REKN survival and HSC egg density indicate that sustained high HSC egg densities (held constant at the highest observed levels) can potentially promote the rapid recovery of the REKN population (Fig. 7).

It is important to recognize that the relationship between HSC abundance and HSC surface egg densities, which is critical for assessing the link between HSC harvest (which affects abundance) and REKN population persistence (which depends upon surface egg densities) remains unclear. Notably, surface egg densities are uncorrelated (in many cases, weakly negatively correlated) with the CMSA results and other trawl-based indices of HSC abundance (Fig. 8). Although knowledge of the link between HSC abundance and egg densities is clearly critical for managing the HSC stock in Delaware Bay, the true HSC abundance in Delaware Bay remains poorly characterized (see part 2, above), and the relationship between HSC abundance and the density of eggs accessible to shorebirds remains poorly understood. Therefore, caution should be used in interpreting any direct comparisons between models using HSC abundance versus egg density as a predictor variable (Figs. 6, 7), as these covariates are not strictly comparable. However, common sense dictates that there is a relationship between HSC egg availability and HSC abundance. Furthermore, the dependability of the egg resource year after year (and ultimately, the recovery of the REKN population) may require a “superabundance” of horseshoe crabs in Delaware Bay, ensuring an adequate supply of eggs available to REKNs even in years where environmental processes may be unfavorable to horseshoe crabs, the timing of their spawning, or the processes that dislodge eggs and make them available to foraging shorebirds. Finally, given the limited state of knowledge about the relationship between surface egg densities and HSC abundance, it is precautionary to assume a strong direct relationship whereby

lower HSC population numbers (e.g., via harvest or other anthropogenic sources of mortality) can reduce the number of HSC eggs available for shorebirds during the critical stopover period.

Finally, the results of this reanalysis strongly argue for continued rigorous monitoring of HSC surface egg densities at multiple beaches across Delaware Bay (on both the DE and NJ sides), as these data are critical for assessing the ecological link between HSCs and REKNs. By ignoring this source of data, ASMFC's revised ARM framework misrepresents the importance of the HSC egg resource to the REKN population and thereby underestimates the risk posed by HSC harvest to the long-term viability of the REKN population. By recommending harvest of female horseshoe crabs each year, the ASMFC's ARM framework has the potential to impede both the survival and the recovery of the REKN population.

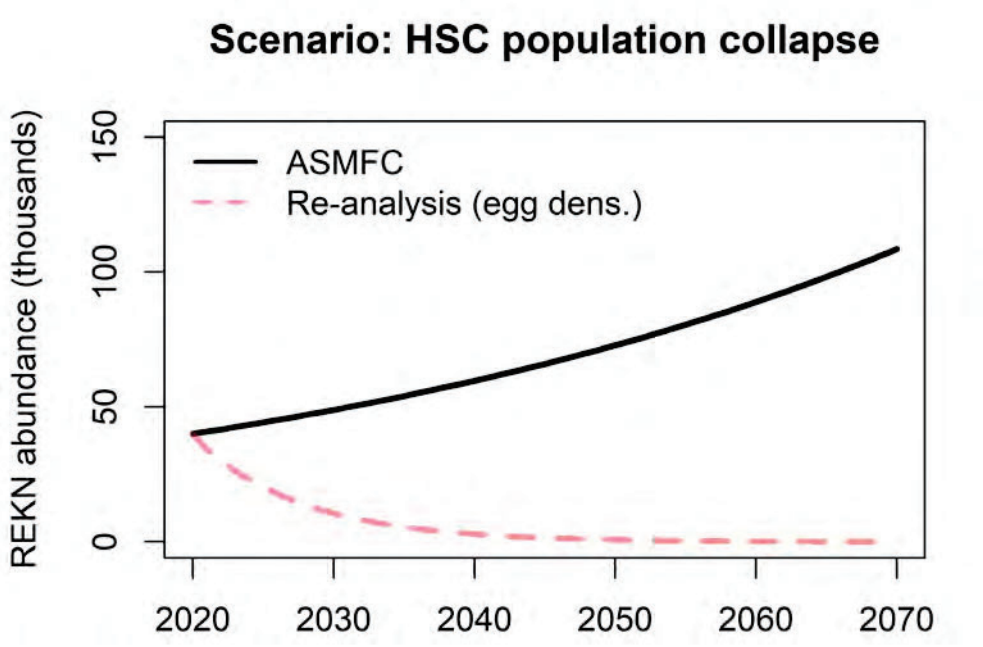


***Figure 6**. Results from 'back of the envelope' calculations of REKN population growth under scenarios with a depleted HSC population. The solid black line represents REKN abundance from 2020 through 2070 under the HSC-REKN relationship described in the ASMFC ARM framework, which was trained using the CMSA model as a proxy for the HSC egg resource in Delaware Bay. The numbers used for this calculation reflect the mean survival and fecundity values assuming a HSC population of zero. The dashed red line represents REKN abundance from 2020 through 2070 under a reanalysis in which the HSC-REKN relationship was trained using surface egg density data as a proxy for the HSC egg resource in Delaware Bay. In sharp contrast to the ASMFC model, the relationship fitted to the HSC egg density data indicate that collapse of the HSC population (here defined as the lowest observed annual surface egg density values) could easily drive the collapse of the REKN population in Delaware Bay. Note that this figure is based on a simple age-structured population model and does not incorporate a density-dependence mechanism (the revised ARM includes a density ceiling that prevents the REKN population from growing above ~150k).*

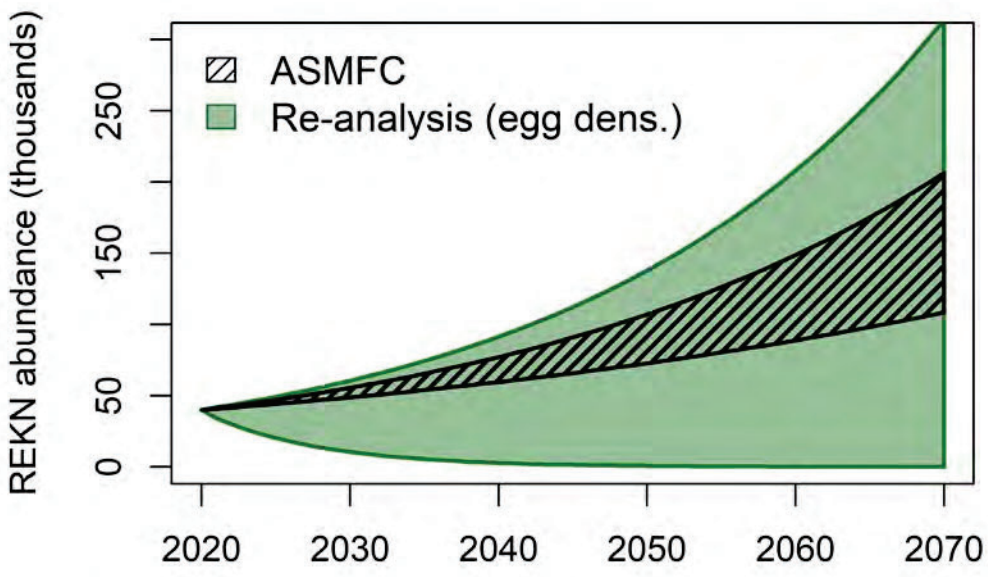


***Figure 7**. Results from 'back of the envelope' calculations of REKN population growth under scenarios ranging from a worst-case scenario of HSC population depletion (see Fig. 6) to a favorable scenario with constant HSC abundance/egg density at the highest levels observed from the early 2000s to present. The black hashed polygon (with diagonal lines) represents REKN abundance from 2020 through 2070 under the HSC-REKN relationship described in the ASMFC ARM framework, which was trained using the CMSA model as a proxy for the HSC egg resource in Delaware Bay. The light green polygon represents REKN abundance from 2020 through 2070 under a reanalysis in which the HSC-REKN relationship was trained using surface egg density data as a proxy for the HSC egg resource in Delaware Bay. In sharp contrast to the ASMFC model, this reanalysis indicates that HSC egg densities can strongly impact whether the population thrives (under consistently high surface egg densities) or declines to extinction (under consistently low egg densities). Note that this figure is based on a simple age-structured population model and does not incorporate a density-dependence mechanism (the revised ARM includes a density ceiling that prevents the REKN population from growing above ~150k).*

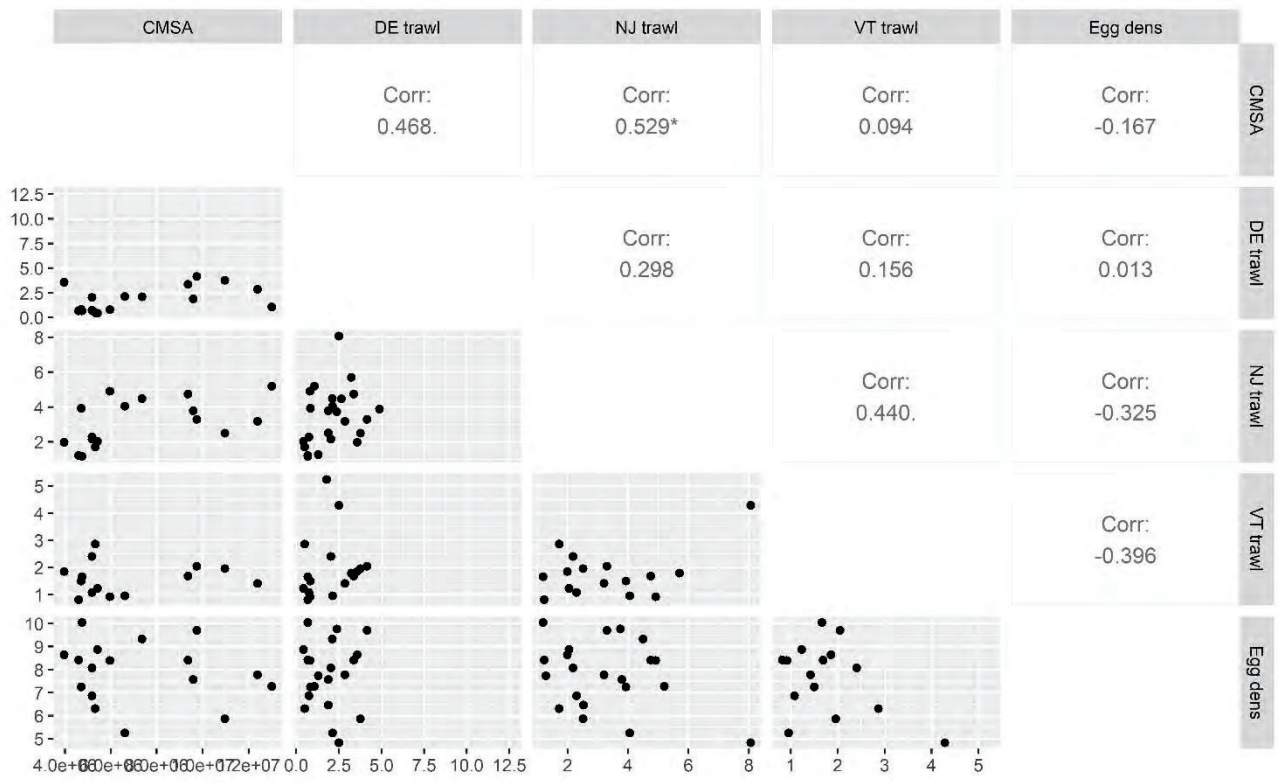


Figure 8*. Scatterplot matrices (lower diagonals) and Pearson correlation tests (upper diagonals) for HSC abundance indices derived the CMSA model (used as an estimate of HSC abundance in the ARM framework), three trawl-based surveys conducted in the Delaware Bay area from 1990 to 2022 (used for training the CMSA model; adjusted for seasonality and survey conditions), and surface egg densities (NJ side only). The only statistically significant correlation among these five indices was between the CPUE estimates from the NJ trawl survey and the CMSA results. There was no apparent correlation between surface egg density measurement and any trawl-based index of HSC abundance (including the CMSA results). In fact, surface egg density had a weakly negative relationship with most trawl-based indices of HSC abundance. DE trawl data were provided on Aug 10, 2023. This work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife. Note that fulfillment of data requests does not constitute endorsement by the NJ Marine Resources Administration of any analyses or end products derived from the requested data.*

4. The ARM exaggerates the evidence for an increasing trend in the number of female HSCs in Delaware Bay

ASMFC used their CMSA model (which used the DE, NJ and VT trawl surveys as primary data sources) to claim that the HSC population in Delaware bay has been undergoing a recovery (population increase) during the period from 2003 to 2018 (ASMFC 2001). Furthermore, Smith et al. (2022) documented evidence for an increase in HSC surface egg densities during the same period. However, after controlling for potentially confounding factors like seasonality, water temperature, and differences in survey effort and methodology, neither the trawl-based surveys used by ASMFC nor the egg-density surveys show strong evidence for increasing abundance of female HSCs in Delaware Bay over the last 20 years.

The NJ trawl data provides an interesting case-in-point. The raw catch-per-unit-effort (CPUE) from New Jersey's ocean trawl survey (one of the major data sources used by ASMFC for documenting a positive trend in HSC abundance) appears to indicate increasing female HSC abundance from 2003 to 2022 (statistically significant at alpha=0.05; Fig. 9). However, when raw CPUE numbers are adjusted for strong effects of seasonality, water temperature, depth and dissolved oxygen on HSC captures in Delaware Bay (Fig. 10) the apparent positive trend in HSC CPUE disappears, becoming statistically inconclusive on the basis of a linear regression weighted by the inverse of sampling variance (Fig. 9). The values used by ASMFC to represent the NJ trawl data values in their CMSA model (which used only trawl data from April and August; ASMFC 2021) match closely with the unadjusted CPUE numbers (Fig. 9; results are similar using all months instead of only April and August trawl results), indicating that ASMFC's estimates of HSC population dynamics failed to control for differences in season and survey conditions. This result was consistent whether or not all NJ trawl results were used for model fitting or whether the data were filtered to include only the months used by ASMFC (April and August). Therefore, the increasing trend in the HSC population reported by ASMFC and used in the ARM may (at least in part) be an artifact of differing survey conditions (e.g., differences in trawl depth or water temperature) rather than evidence of recovery of the HSC population over time.

Similarly, when the egg-density data were adjusted for known differences in survey methodologies (primarily, differences in sampled area), the apparent positive trend in HSC

surface egg densities (Smith et al. 2022) became weak and inconclusive (note that this correction did not impact the estimated relationship between REKN survival and HSC egg-densities) (Fig. 11). Thus, my reanalysis of both the trawl-based surveys (Figs. 9, 10) and the egg-density surveys (Fig. 11) indicates that perceived positive trends in HSC population indices may reflect sampling differences and not trends in the underlying HSC population. Although these findings suggest the trend estimates reported by Smith et al. (2022) may be in error, this finding does not call other findings from Smith et al. (2022) into question, as these findings do not strictly depend upon the comparability of surface egg density samples collected during the study period.

Finally, I tested whether the aggregate evidence from the three trawl-based surveys (both adjusted and unadjusted; see part 2 of this report) showed evidence for HSC population recovery. Specifically, I ran linear regression models combining the CPUE estimates (both adjusted and unadjusted) from all three trawl surveys to assess evidence for an aggregate trend in abundance over time. Neither the raw HSC capture efficiencies (CPUE) from the trawl surveys nor the adjusted CPUE estimates showed conclusive evidence for a trend in HSC abundance over time (Fig. 12). With little correlation in inter-annual variation among trawl surveys (Figs 4, 8), years in which one trawl-based survey tended to indicate a large HSC population were rarely reinforced by the other surveys, resulting in a regression to the mean (Fig. 12).

Overall, the above results suggest that the ARM framework exaggerates the evidence for an increasing trend in female HSC abundance over the first two decades of the 21st century. In so doing, the ARM framework predicts recovery of the HSC population in Delaware Bay under a *status quo* scenario whereby HSC harvest regulations and other protections are maintained at current levels. In contrast, the results from my reanalysis suggest that the recovery of the female HSC population may require additional safeguards – including possibly decreasing harvest and continuing to improve and restore habitat at spawning beaches. Furthermore, by overstating the evidence for recent increases in the HSC population, ASMFC thereby likely underestimates both the vulnerability of the HSC population to harvest pressures in Delaware Bay and the potential carryover impacts on the REKN population.

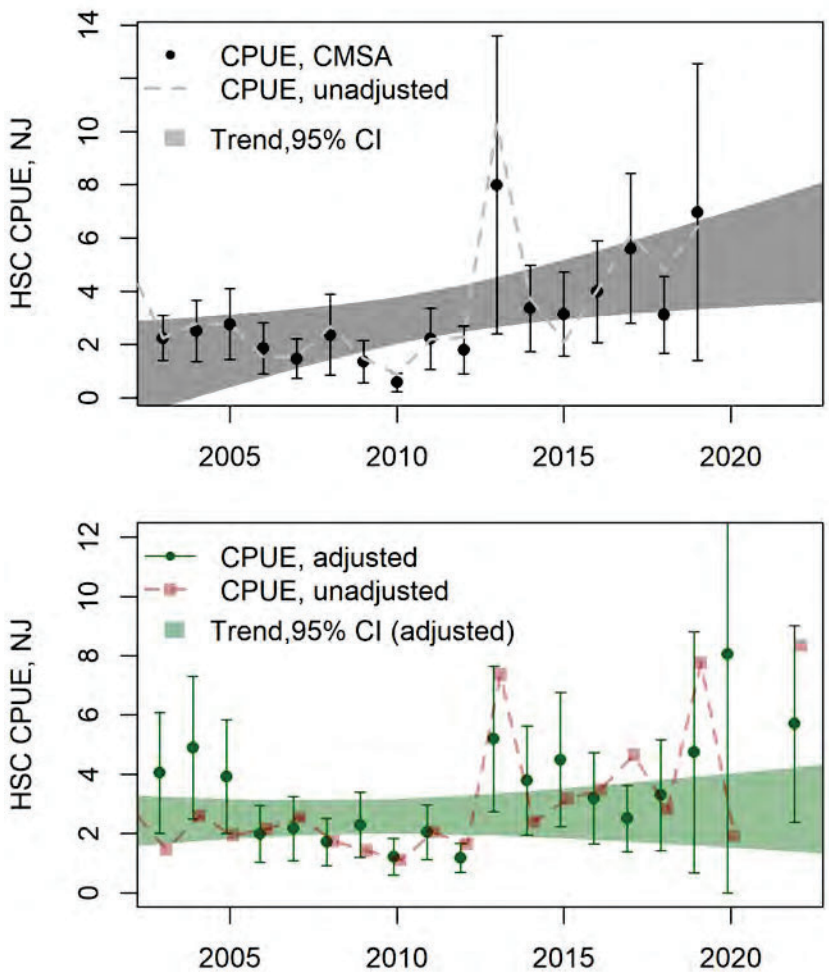


***Figure 9**. Annual HSC catch-per-unit-effort (CPUE; a type of abundance index) for trawl surveys conducted by the state of New Jersey from 1999 to present. The top figure compares the numbers used by ASMFC for their Catch Multiple Survey Analysis (CMSA) model (black), compared with the unadjusted, raw CPUE computed from the raw data (for comparison, only surveys conducted in April and August were used to compute CPUE; however, results look similar with raw CPUE for all months combined). The gray polygon represents the 95% confidence interval for the linear regression of the unadjusted CPUE against time in years. The bottom panel displays CPUE estimates adjusted for the effects of seasonality, water temperature, depth, and dissolved oxygen, with the dashed gray line and points again representing the (unadjusted, all months combined) CPUE computed from the raw data. Error bars represent 95% credible intervals. The green polygon represents the 95% confidence interval for the linear regression of the adjusted CPUE against time in years, showing no substantive trend over time.*

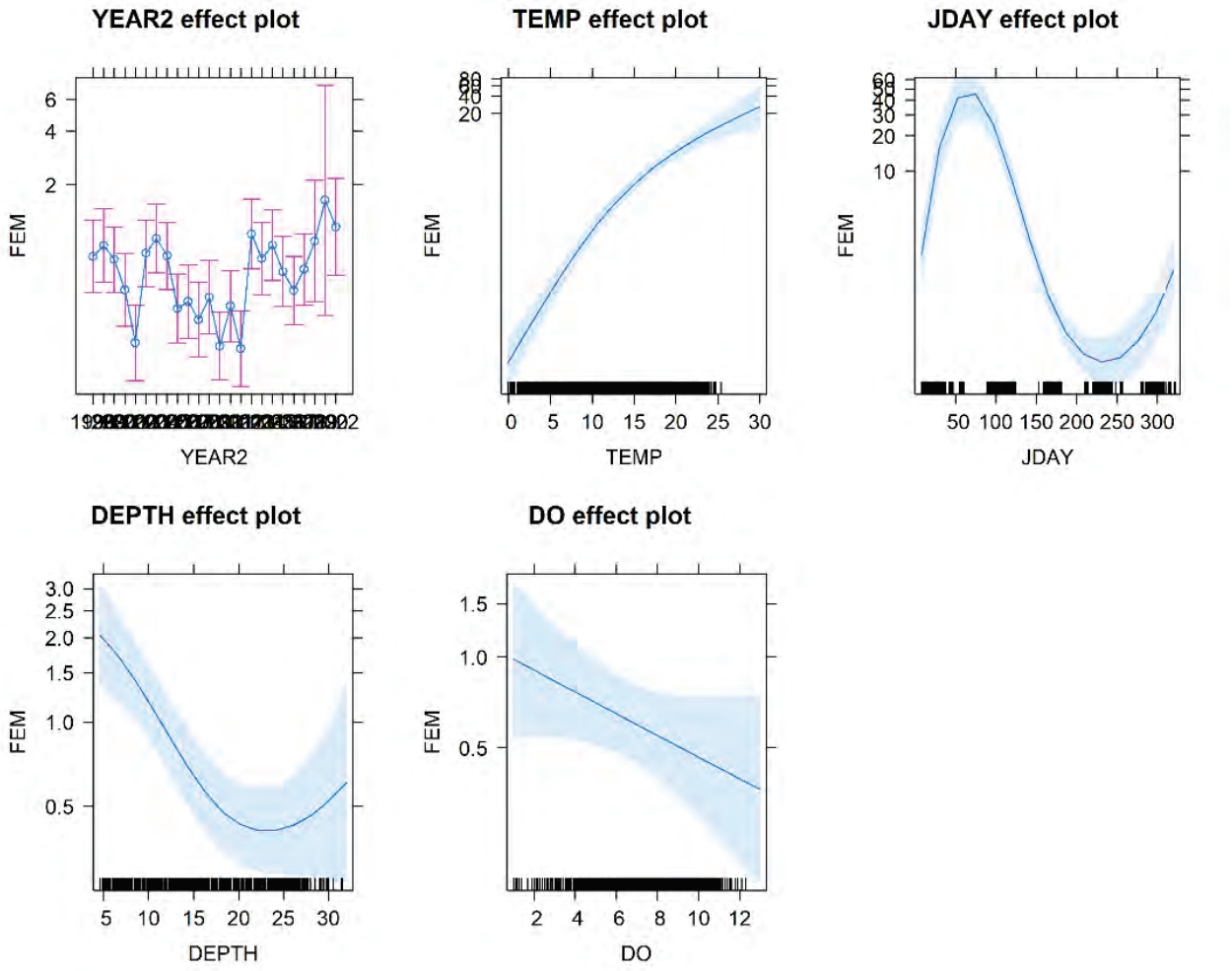


Figure 10*. Effects plots illustrating strong, non-linear effects of season and environmental covariates (from top left to bottom right: year, temperature, Julian day, trawl depth, and dissolved oxygen) on the results of the ocean trawl surveys conducted in the Delaware Bay region by the state of NJ. These figures are predictions from a generalized linear model (GLM) using a negative binomial error distribution, quadratic terms to represent non-linear relationships, and an offset term to accommodate differing effort among surveys (amount of seafloor surveyed). The 'rug' on each plot illustrates the distribution of data for each quantitative covariate. Each panel represents the expected effect of a single predictor variable (indicated by the x-axis label), holding all other predictor variables at their mean or most frequent value. Therefore, although temperature and dissolved oxygen (DO) are closely linked, the DO effect plot illustrates the effect of DO after factoring out the effect of temperature.*

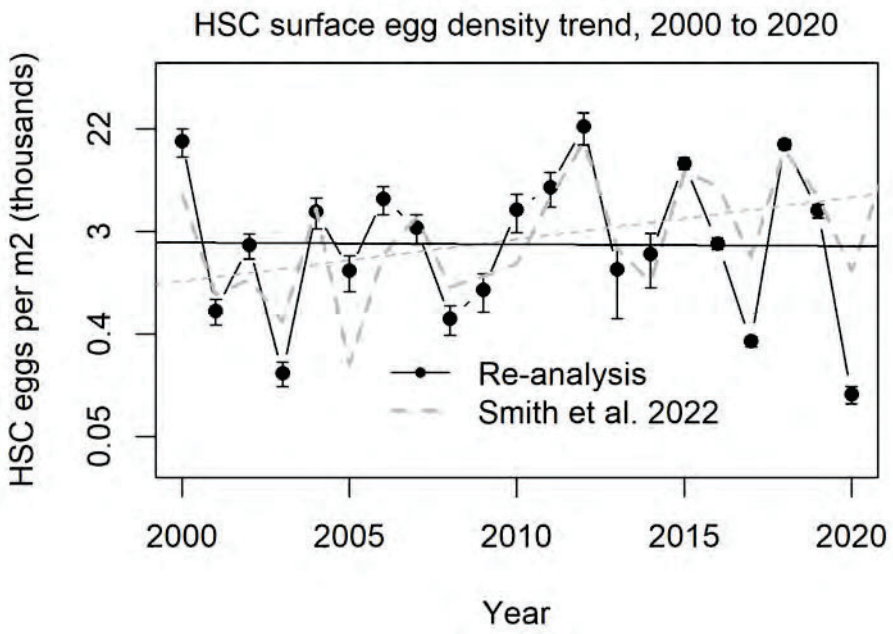


***Figure 11**. Reanalysis of the evidence for a temporal trend in long-term surface egg density data from 2000 to 2020. Although the original analysis (Smith et al. 2022) detected a weak but non-negligible positive trend over time (dashed grey line), this regression relationship became inconclusive after accounting for differences in survey methodology across the 20 year study period (area represented by each sampling unit). Therefore, the increasing trend reported in Smith et al. (2022) appears to be an artifact of differing sampling methodologies used during this time frame.*

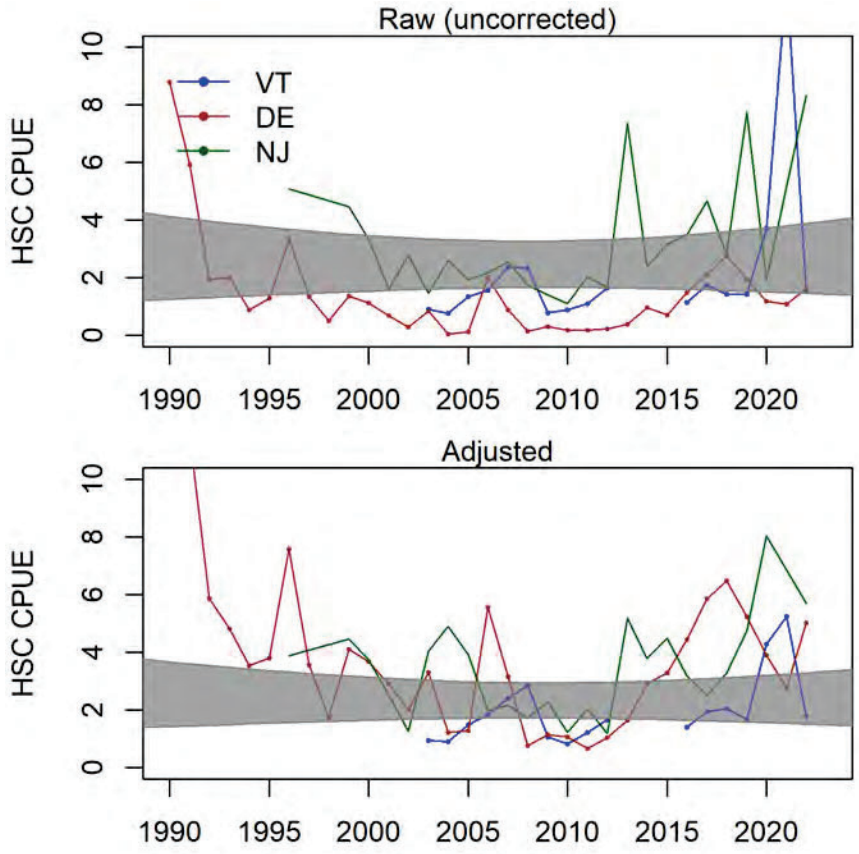


Figure 12*. Raw and adjusted HSC catch-per-unit-effort (CPUE, which serves as an index of abundance) from three trawl surveys conducted in the Delaware Bay area from 1990 to 2022. Transparent gray polygons represent the 95% confidence region for a linear regression of CPUE (aggregated across the three surveys) across time. Top panel represents raw CPUE, whereas CPUE values in the lower panel are adjusted for the effects of seasonality, water temperature, salinity, dissolved oxygen, and depth. Taken in aggregate, the trawl data indicate an uncertain and variable population that is neither increasing nor decreasing over time. DE trawl data (Delaware Division of Fish & Wildlife, Delaware Department of Natural Resources and Environmental Control) were provided on Aug 10, 2023. This work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife. Note that fulfillment of data requests does not constitute endorsement by the NJ Marine Resources Administration of any analyses or end products derived from the requested data.*

5. The statistical model (IPM) used for estimating REKN population parameters is over-parameterized and likely to yield spurious results

Like many Integrated Population Models (IPMs), ASMFC's Red Knot IPM comprises two sub-models: (1) a "state-space" model for estimating abundance and recruitment on the basis of population counts over time, and (2) a model for estimating survival on the basis of capture-recapture data (history of observation records for all uniquely marked individuals) (Schaub and Kery 2021). In the REKN IPM, the state-space model is trained using annual 'peak count' data (total number of REKNs observed during annual aerial and ground surveys), and the capture-recapture model is trained using REKN banding and resighting records from Delaware Bay. Whereas adult REKN survival (capture-recapture model) can be estimated directly from available capture-recapture records (banding and re-sighting data from Delaware Bay), recruitment of juvenile REKNs into the adult population (state-space model) is not directly estimable from the peak-count data. Instead, the IPM estimates annual recruitment rates indirectly, as the offsets required to match the observed dynamics of the peak-count data while accounting for expected losses to mortality (the latter estimated from the capture-recapture sub-model).

While the data sources for training the capture-recapture model are information-rich (tens of thousands of banding records and hundreds of thousands of resighting observations), the peak-count data used by ASMFC to train the state-space model comprised a total of 14 data points: one for each year from 2005 to 2018. Mathematically, this implies that these data could be used to assign values to a maximum of 14 unknown parameters. However, with several sources of 'noise' present in the data (sources of variation that obscure the important underlying signals), these data are likely to support far fewer than 14 parameters. Some statisticians informally recommend a rule of thumb of 30 data points per parameter for robust parameter estimation; however, the optimal ratio differs depending upon many factors, including the signal-to-noise ratio in the system as well as the risk tolerance of the researcher (Muthen and Muthen 2002). Nonetheless, the REKN IPM treats the peak-count dataset as a much richer source of information than it actually is. In fact, the number of parameters estimated by the state-space model exceeded the number of data points, resulting in a highly over-parameterized model that is inherently prone to generating spurious results. Table 2 (below) enumerates the unknown

parameters estimated in the REKN IPM on the basis of the REKN peak-count dataset.

***Table 2**. Free parameters ('unknowns') estimated using the peak-count data (n = 14) in the REKN IPM*

Description	**Number of free parameters**
Initial abundance	1
Annual recruitment	2 to 12*
Effect of HSC abundance on recruitment	1
Observation error, ground counts	1
Observation error, aerial counts	1
"Availability" parameters	12**
TOTAL	18 to 28

* Random effect
** Strong priors assigned

Taken together, the state-space model used in the REKN IPM estimated between 18 and 28 free parameters on the basis of 14 data points (Table 2). There are two reasons why it is not possible to pinpoint the exact number of free parameters estimated in this model. First of all, the state-space model includes a 'random effect' (representing annual recruitment of new REKNs into the breeding adult population) whereby 12 separate estimates of annual recruitment (12 parameters) are generated on the basis of a two-parameter Gaussian ('normal') distribution (mean and variance; known as 'hyperparameters'). Therefore, the number of free parameters used to estimate annual recruitment could be as high as 12 (number of annual recruitment estimates) or as low as 2 (number of 'hyper-parameters' used for generating the 12 annual estimates); the "truth" lies somewhere between those two extremes. Secondly, several parameters in the state-space model (notably, the 12 'availability' parameters, representing the fraction of the stopover population observable in the aerial and ground counts) were assigned relatively strong priors (in Bayesian inference, parameter estimates combine prior knowledge with additional knowledge inferred from the data). These strong prior distributions were

assigned to the 'availability' parameters on the basis of comparisons between the peak-count data and REKN abundance estimates generated annually as part of the ARM (Lyons 'superpopulation' models). Therefore, one could argue that the 12 'availability' parameters were not strictly 'free parameters' (or 'unknowns') since they were constrained by previous information from the Lyons models. However, my tests indicate that the 'availability' parameters remained sensitive to the peak-count data, and therefore it is more correct to treat these terms as free parameters ('unknowns') rather than as fixed parameters. Nonetheless, even in the most generous interpretation (~8-10 free parameters), the number of unknowns in the state-space model is far greater than the peak-count data (n = 14) could reasonably support, resulting in an over-parameterized model.

Models that fit more parameters than the data can support have a strong tendency to produce spurious results (results that fail to replicate when challenged with new data). Statisticians call such models "over-parameterized", or "over-fitted", and this problem is widely understood by quantitative researchers and statisticians (McNeish 2015). Among the free parameters estimated from this over-fitted model are several terms vital for understanding and simulating REKN population dynamics, including initial abundance, population trends (growth or decline), mean recruitment rate, and the effect of HSC abundance on recruitment. Due to over-fitting, these key parameters in the ARM model are likely to reflect random noise in the peak count data rather than the demographic reality of the REKN population.

To confirm the tendency of the REKN IPM to generate spurious results, I simulated artificial 'peak-count' data under a 'white noise' process (with no underlying trend) and assessed how often the IPM detected a spurious trend. To do this, I ran the IPM 50 times, each time replacing the REKN peak count data with random "white noise" generated using the same mean and variance as the observed peak-count data. Using the REKN abundance estimates from each of the 50 replicates, I ran a linear regression model with log transformed median REKN abundance as the response variable and time (year; 2003 to 2022) as a continuous predictor variable. For each replicate, I recorded whether the temporal trend of abundance over time was "significant" at alpha=0.05, along with the sign and magnitude of the inferred trend. As a second test, I ran 100 80-year projections (one set of projections for each of the 50 replicates) using the

time-varying survival and recruitment estimates from the IPM to project REKN abundance from 2023 to 2100 (propagating uncertainty using standard Bayesian demographic modeling techniques; Goodman 2002). Since the 'peak-count' data in these replicates were simulated with no underlying trend, the final abundance should match the initial abundance on average.

The results demonstrated that the IPM more often than not detected spurious temporal trends in REKN abundance (increases or declines in abundance over time) during the study period (Fig. 13). In fact, linear regressions (n = 50) fitted to the estimated log-median abundance from 2003 to 2022 indicated a non-negligible spurious temporal trend for 84% (42 of 50) of replicates at alpha = 0.05. Consequently, the results from projecting abundance forward to the year 2100 showed a strong tendency to erroneously produce estimates of final REKN abundance either much lower or much higher than the initial abundance (Fig. 14). Surprisingly, spurious negative trends were more common in my analysis than spurious positive trends in my analysis (Fig. 14). However, it is likely that this result is an artifact of the particular data simulation methods, model specification and initial values I used, and I caution against using this result to infer a systemic bias in the REKN IPM results. The apparent biases in my test results may be sensitive to many aspects of model specification, from the distribution and transformations used for simulating the peak-count data, to the prior distributions specified, to the initial values used for Markov-chain Monte Carlo (MCMC) simulations. Lacking access to the full modeling workflow used by ASMFC, I specified many of these parameters somewhat arbitrarily (lacking the bandwidth to complete a full sensitivity analysis). In addition, I modified the capture-recapture data to account for potential misread errors (see above), and this change could have potentially changed or even reversed any apparent biases in the modeling framework used by ASMFC. Therefore, additional sensitivity tests would be necessary to understand the conditions under which systemic biases may manifest in this modeling framework.

Due to over-parameterization, the REKN IPM is unstable and has a strong tendency to produce spurious results. Therefore, the REKN demographic simulations used in the ARM framework are unlikely to accurately capture the dynamics of the real-word population of *Rufa* Red Knots inhabiting Delaware Bay each Spring. Overall, the tendency of the REKN IPM to produce spurious results suggests that this model should not be used for assessing REKN

conservation status, running scenario tests, or guiding recovery efforts for a federally Threatened species.

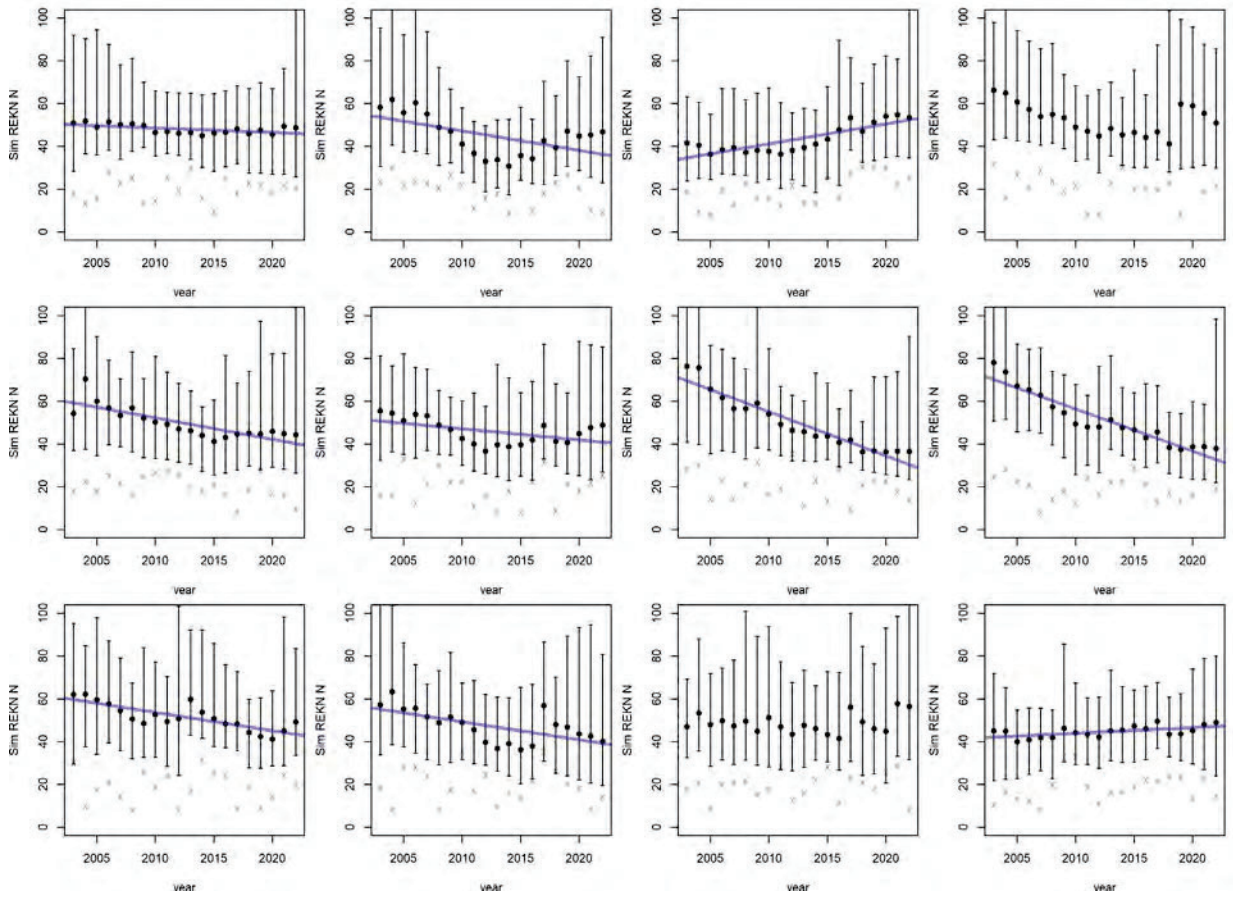


Figure 13*. Simulated REKN abundance (in thousands) over time for 12 replicates (randomly chosen from among 50) of the REKN IPM from 2003 to 2023 in which the peak-count data were replaced with random noise with no underlying trend (simulated data are represented by "X" symbols in the above panels). In many of these replicates, the IPM results detected a spurious trend over time (regression lines in the above panels) despite the lack of a trend in the count data.*

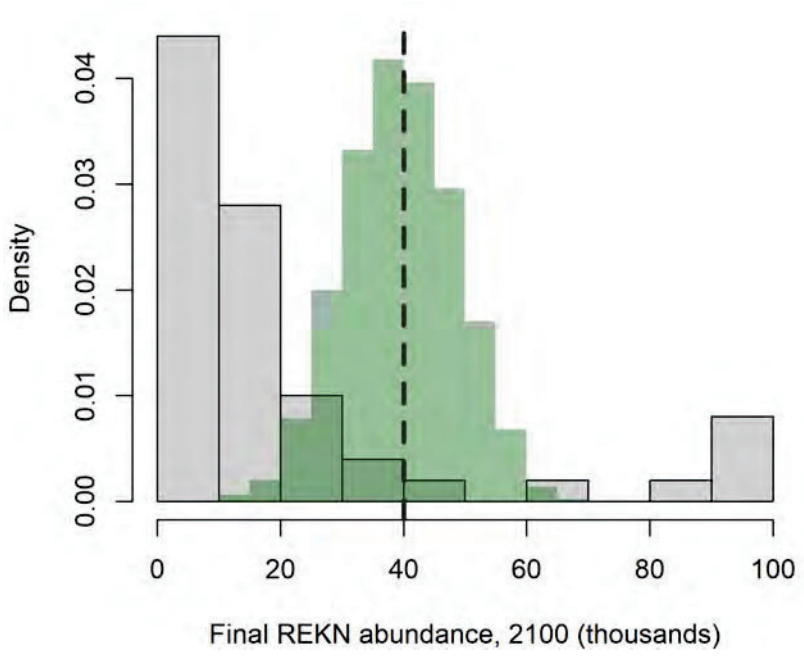


Figure 14*. Histogram of median simulated REKN abundance at year 2100, based on the results from 50 replicates of the REKN IPM whereby the 'peak-count' data were iteratively replaced by randomly generated white noise with the same mean and standard deviation as the observed peak-count data (bars with gray fill). The vertical dashed line represents the initial abundance for the simulations (40,000 REKNs). Since the peak-count data were simulated with no trend, the final simulated abundance should match the initial abundance on average – which in this case would imply a single peak centered on the initial abundance (green histogram). However, the peaks at abundances near zero and 100 indicate that many of these simulations (fitted to white-noise) spuriously projected either near-extinction or a full recovery of the population after 80 years. The fact that more replicates projected spurious declines versus spurious growth is likely to be an artifact of the simulations rather than a systematic bias inherent to the REKN IPM.*

6. The IPM exhibits poor fit to the available data

Goodness-of-fit (GOF) testing is a critical validation step in any model-fitting workflow (e.g., assessing the normality of residuals in linear regression), ensuring that key assumptions made during the modeling process are reasonable and justified (Conn et al. 2018). In the case of IPMs, simulation studies have indicated that indirect estimates of latent parameters (like recruitment rates in the REKN IPM) can be highly sensitive to model assumptions, and can produce biased

and nonsensical results if key assumptions are violated (Riecke et al. 2019; Schaub and Kery 2021). Therefore, it is critical to assess model goodness-of-fit (GOF) to assess whether IPM assumptions are reasonable (Conn et al. 2018). If an IPM fails to exhibits a reasonable fit to the data, key model parameters (like recruitment rates in the REKN IPM) should be used with extreme caution (Riecke et al. 2019).

In the context of hierarchical Bayesian analysis (the paradigm used by the ASMFC modelers), a commonly used approach is to run a Posterior Predictive Check (PPC), in which data are repeatedly simulated under the fitted model and compared to the actual data (Kery and Schaub 2011; Schaub and Kery 2021). If a model is unable to simulate data resembling the real-world observations, the model is determined to be an inadequate representation of the true processes that generated the data. 'Bayesian p-values' are often used to summarize GOF for IPMs, and represent the fraction of simulated datasets whose variance from expected values exceeds that of the true observations (Kery 2010). Whereas statisticians have noted that Bayesian p-values tend to understate a model's lack of fit (Conn et al. 2018), and research on assessing GOF for IPMs is ongoing, Bayesian P-values remain the most commonly used and reported GOF statistic for models like the REKN IPM (Schaub and Kery 2021).

In their ARM report, ASMFC mentions (but does not further document) two PPCs that were performed to assess goodness-of-fit for the IPM. One of these tests – the only test included in the publicly shared IPM code – uses a PPC to assess the degree to which the state-space model adequately represented the peak-count data. However, this test has been previously demonstrated to be an insufficient gauge of model adequacy (Schaub and Kery 2021). Furthermore, the over-parameterization of the state-space model (see above) virtually guarantees that the state-space model will pass this test (over-parameterized models tend to exhibit excellent fit to the observed data, although they tend to perform poorly in other contexts). The second and final goodness-of-fit test mentioned in the ARM report (which suggests mild lack of fit) is not included in the version of the IPM code shared publicly, so it is impossible to assess what test was actually run. However, I ran three additional PPCs to assess the degree to which the IPM (specifically, the open robust design component of the IPM) adequately represented the REKN resighting data from 2003 to 2022. These tests, which were

used and reported in an earlier version of the open robust design (ORD) model for estimating REKN survival and stopover use (Tucker et al. 2021), indicated poor fit to the data (Figure 15), suggesting that the IPM is an inadequate representation of key processes operating in the REKN population – including survival and recruitment. The failure of the IPM to pass rigorous goodness-of-fit tests casts additional doubt on conclusions generated from this model.

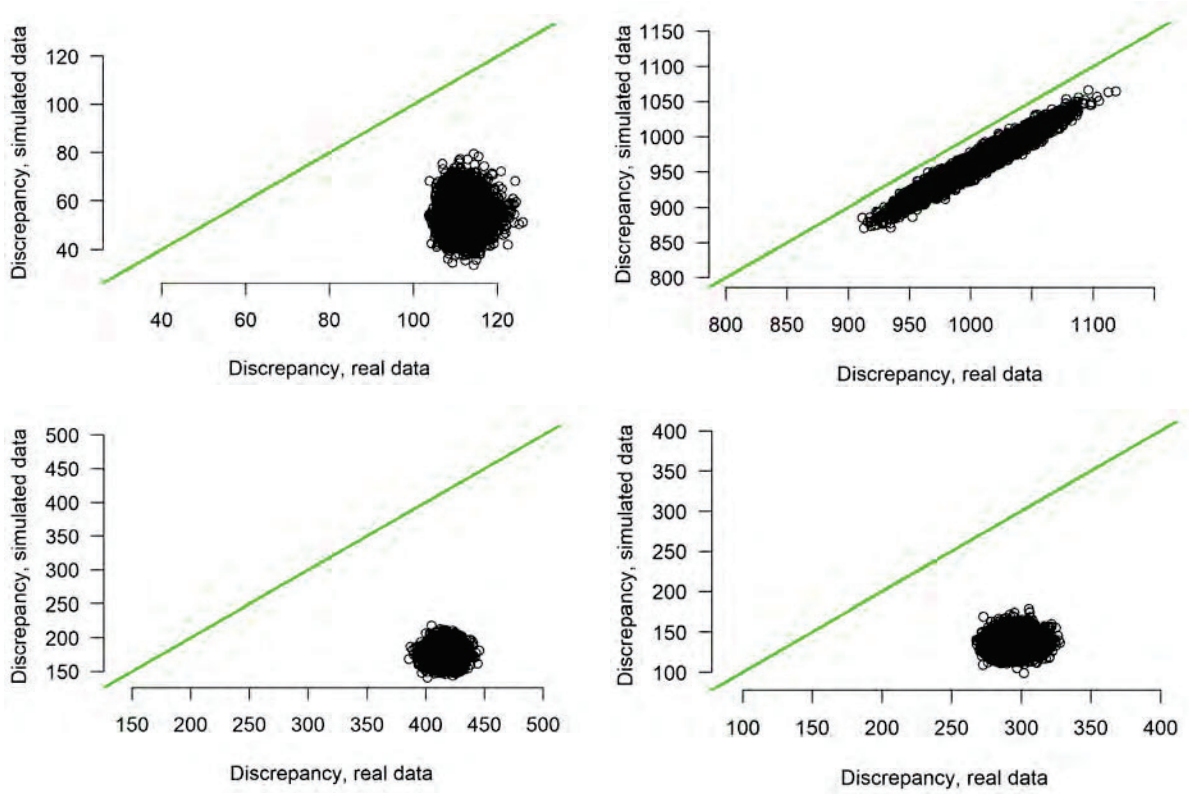


Figure 15*. Four goodness of fit (GOF) tests for the open robust design (ORD) component of the REKN IMP. GOF test #1 (upper left) assesses the adequacy of the survival and temporary emigration parameters, and is therefore the most directly relevant to the REKN population model. The remaining tests assess model fit to the timing of arrival within each year (upper right), numbers of 'transients' observed during each 3-day survey period (lower left), and recaptures of non-transients during each 3-day survey period (lower right). Bayesian p-values for all tests are equal to 1, indicating severe over-dispersion of the data relative to model predictions.*

CONCLUSION

Building on the issues identified in my 2022 review of this ARM framework, I have outlined six additional concerns about the validity of ASMFC's revised ARM framework as a tool for assessing and managing the risks to the *Rufa* Red Knot posed by the horseshoe crab harvest in Delaware Bay. First, I demonstrated that a major component of the Integrated Population Model (used for modeling REKN population dynamics) is severely over-parameterized and prone to generating spurious results. Second, I presented evidence that ASMFC's estimates of REKN survival were biased high due to failure to account for misread errors, thereby artificially inflating the resilience of the REKN population to short-term fluctuations in recruitment. Third, my reanalysis showed that trawl-based indices of HSC abundance – and the CMSA model used by ASMFC for estimating HSC abundance dynamics – have no conclusive relationship with REKN survival. Fourth, I showed that HSC surface egg density has a strong relationship with REKN survival, suggesting that ASMFC is strongly underestimating the strength of the biotic interaction and the dependency of REKNs on HSC eggs for population survival and recovery. Fifth, I show that the ARM exaggerates the evidence for an increasing trend in the number of female HSCs in Delaware Bay, thereby likely over-estimating HSC population resilience to harvest pressure. Finally, I present evidence that ASMFC's model of REKN population dynamics exhibits poor fit to the data, casting additional doubts on the validity of the ARM's model of REKN population dynamics. Based on these concerns, I conclude that this ARM framework is not useful for managing risk to the REKN population due to HSC harvest. Furthermore, my results suggest that the revised ARM misrepresents the importance of HSCs to the REKN population and thereby underestimates both the existential risk to the REKN population posed by female HSC harvest and the potential for promoting REKN recovery through increased regulatory protections and conservation efforts aimed at promoting HSC population increases in the Delaware Bay region.

Acknowledgments

I am thankful to numerous people and organizations for sharing data for reanalysis in this project. First, Lena Usyk and bandedbirds.org were extremely helpful in providing access to the Red Knot banding and resighting data from Delaware Bay. Thanks to the many agencies,

biologists and volunteers who contribute time and expertise to these data collection efforts. I thank Linda Barry, Jeff Brust, and the New Jersey Marine Resources Administration (NJ DEP Fish and Wildlife) for sharing data on female horseshoe crab captures from the NJ ocean trawl surveys from 1999 through 2022. Note that fulfillment of data requests does not constitute endorsement by the NJ Marine Resources Administration of any analyses or end products derived from the requested data. Similarly, I thank Jordan Zimmerman and the Delaware Division of Fish & Wildlife, Delaware Department of Natural Resources and Environmental Control, for sharing horseshoe crab capture data from the Delaware 30 ft. Trawl Surveys from 1990 to 2022 (data provided on Aug. 10, 2023). Note that this work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife. Finally, I thank Joseph A.M. Smith for sharing data on surface densities of horseshoe crab eggs, and everyone involved in collecting these data from 2000 to present.

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SUPPLEMENTAL ANALYSES

Note on the incorrect specification of the "pi" parameter in the REKN IPM

Although not directly related to any of the six primary critiques in this report, it is nonetheless important to note here that the "*pi*" parameter in the REKN IPM, which represents the fraction of the flyway population that is present at the stopover site at any given 3-day time window, is incorrectly specified in the ARM model. This parameter is used internally within the IPM for adjusting the total estimated flyway abundance to reflect the number of REKNs using the stopover at the time of the peak count surveys. Therefore, this parameter provides a critical link between the open robust design model and the state-space model within the IPM, helping to refine estimates of REKN abundance and population trends.

In the REKN IPM, the computation of *pi* follows two steps. First, for each 3-day occasion during the stopover period each year, the probability of being present in the stopover (conditional on using the stopover at least once that year) is computed using the *delta* (arrival) terms, the *tau* (stopover residency) and the *psi* (stopover retention/persistence) parameters. This derived term, which appears to be performed correctly, is called *alpha* in ASMFC's IPM code. To

compute *pi* (proportion of the entire flyway present at the stopover site during each period) from *alpha* (the proportion of stopover users present at the stopover site each period) we just need to multiply alpha by a factor representing the fraction of flyway individuals using the stopover each year (we will call this factor "*z*"). ASMFC computed '*z*' as the sum of two parameters from the open-robust-design (ORD) model: '*gammaII*' and '*gammaOI*', which represent the probability of returning to the stopover (conditional on having been there last year), and the probability of returning to the stopover (conditional on having NOT been in the stopover last year), respectively. Importantly, the '*gammaII*' and '*gammaOI*' parameters are conditioned on two distinct segments of the flyway population; these parameters have no meaning when added together. For 'gammaII' and 'gammaOI' to have meaning at the level of the flyway population, we would need to know the fraction of the flyway population that used the stopover last year, which we call '*f*'. With this information, we could compute *z* and *pi* as:

z = gammaII(f) + gammaOI*(1-f)* (Correct formulation)

*pi = z * alpha*

Multiplying this term (*z*) by *alpha* would yield the appropriate estimate of *pi*. However, ASMFC computed the *z* parameter as:

$z_i = gammaII + gammaOI$ (Incorrect formulation)

$pi_i = z_i * alpha$

Since z_i does not have meaning as a probability (this quantity can theoretically exceed 1), the resulting estimate of *pi* has no discernible meaning. Since *pi* is used to make the link between the annual peak counts and true flyway abundance, this error may introduce another source of bias in the estimates of REKN abundance and growth rate derived from the IPM. Although this is an important error, likely to have implications for the IPM results and the ARM framework, I consider this issue secondary in importance to the over-parameterization of the state-space model.

Note on over-parameterization of ASMFC's REKN survival model

In contrast to the ORD model, the 'classical' Cormack-Jolly-Seber (CJS) framework yielded estimates of the REKN-HSC relationship that were neither positive nor negative (inconclusive; Table 1). The increased tendency of the ORD model to yield conclusive (but negative)

relationships may be a consequence of the increased complexity of the ORD model versus the CJS models, as more complex models have a greater tendency to generate spurious results. Furthermore, there is reason to suspect that the ASMFC model of REKN survival tried to estimate more parameters than the data could support. With 14 years of data used for training the ASMFC model (2005 to 2018), there are 13 years for which survival is theoretically estimable (one fewer than the years of data; Cooch 2008). In the IPM, these 13 estimable rates represent the degrees of freedom (independent information used for parameter estimation) needed for modeling annual variation in REKN survival. In ASMFC's IPM, these 13 data points are used to estimate no fewer than five parameters: (1) the effect of HSC abundance on REKN survival, (2) the effect of spawn timing on REKN survival, (3) the effect of arctic snow cover on REKN survival, (4) an interaction between HSC abundance and spawn timing, and (5) a temporal process variance that allows survival to vary among years. Fitting five parameters using 13 degrees of freedom (a ratio of 2.6 data points per free parameter) suggests that this model (like the model of REKN recruitment; see above) is prone to over-fitting and thereby producing spurious results (see above).

The model instability that is characteristic of over-fitted models is apparent in the estimation of the effect of trawl-based HSC indices on REKN survival. Notably, when I specified the ORD model with the full set of time-varying covariates used by ASMFC – including HSC abundance derived from the CMSA model, the fraction of HSCs spawning in May, arctic snow cover, and an interaction between HSC and HSC spawn timing -- the previously significant (and nonsensical) negative relationship between HSC abundance and REKN survival disappeared (B= -0.04, 95% CI: -0.20 to 0.08). This relationship remained inconclusive regardless of whether potential misread errors were included in the model training set.

Potential biases due to over-representation of Mispillion harbor in the REKN resighting dataset

Tabular summaries of the number of observations by site and by state exposed a strong over-representation of a single study site (Mispillion harbor, in DE) in the REKN resighting dataset, raising concerns that patterns in the REKN survival results used for the ARM framework may represent the idiosyncrasies of a single site rather than general patterns across Delaware Bay

(Fig. S1). In fact, some Delaware Bay shorebird experts indicated to me that Mispillion harbor likely has a greater concentration of HSC eggs than many other sites and tends to support rapid weight gain in REKNs, which could induce lower mortality rates. To test this, I ran multiple models of REKN survival – including the ORD formulation used by ASMFC in addition to simpler Cormack-Jolly-Seber (CJS) models – using data sets excluding Mispillion harbor and including only data from Mispillion harbor. Overall, I found that mean REKN survival estimates were very similar for birds captured inside and outside of Mispillion harbor. However, patterns in survival among years showed some marked differences that could potentially indicate different drivers of survival inside and outside of Mispillion harbor (Fig. S2). In particular, survival for birds captured and resighted in Mispillion harbor was more stable across years, yet showing a slight declining trend. In contrast, survival for birds captured and resighted outside of Mispillion harbor was more variable (showing a strong reduction in 2010 and 2017), with no apparent trend over time.

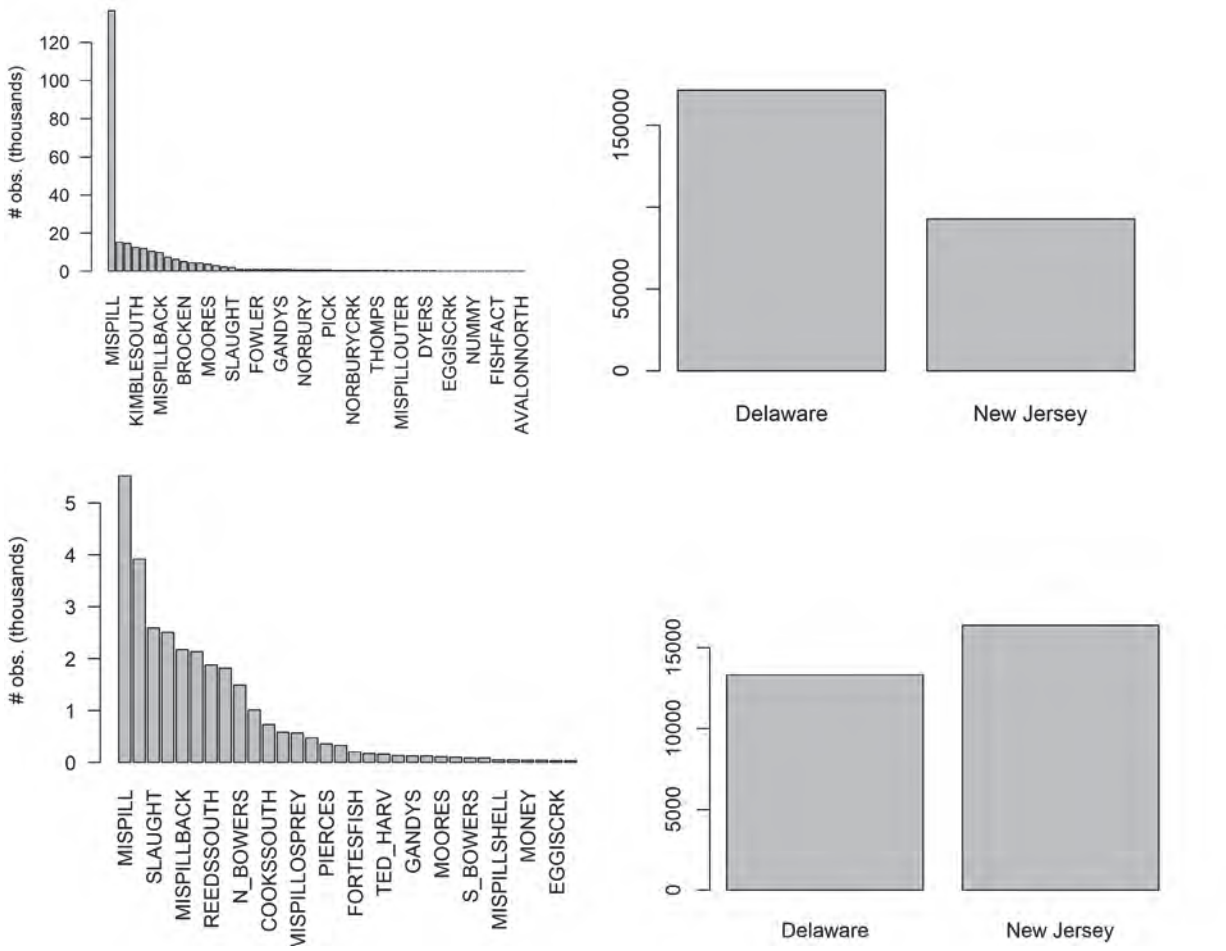


Figure S1*. Top panels: number of resighting observations per site and by state. Note that resighting observations within Mispillion harbor ("MISPILL" in the above figures) far outweigh all other sites, leading to some concern that analysis results may be biased if this site differs from other sites. Delaware (which is dominated by Mispillion harbor data) has about 2x the number of resighting observations than NJ. Bottom panels: banding data summary by site and by state. As opposed to the resighting data, there are more banding records from New Jersey, and Mispillion harbor does not dominate the banding records to the same degree as it does the resighting data*.

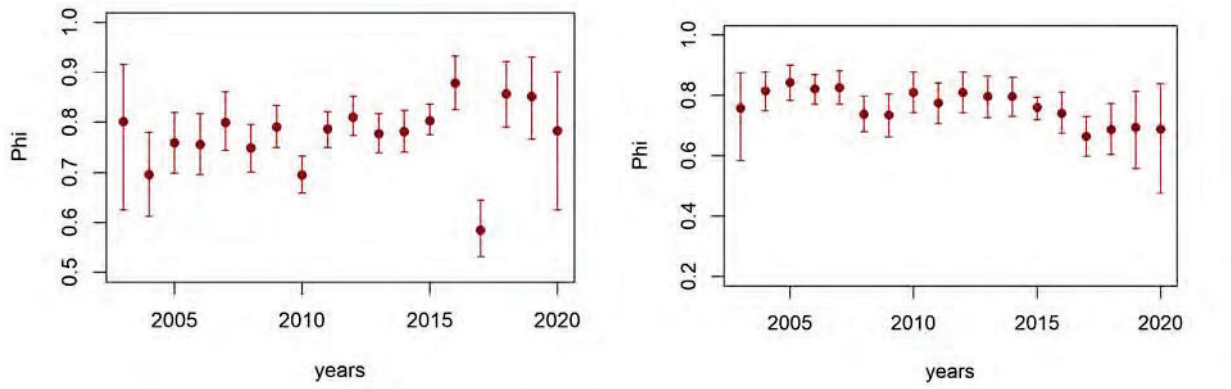


Fig. S2*. Comparison of annual REKN apparent survival estimates using (left) only birds marked and re-sighted outside of Mispillion harbor, and (right) only birds marked and re-sighted inside Mispillion harbor. Only birds first captured in Delaware Bay were included in the analysis, following ASMFC's stated data protocols. This figure illustrates different temporal patterns in survival, with REKN survival showing little trend outside of Mispillion harbor and decreasing slightly for birds captured and resighted inside Mispillion harbor. Outside of Mispillion harbor, estimated apparent survival was particularly low for two years: 2010 and 2017. Both models indicated reasonable goodness of fit.*

Trawl-based indices of HSC abundance

The figures below are a supplement to section 5 of this report, which documents that the evidence for a recent increase in the HSC population in Delaware Bay may be overstated. The figures below illustrate my efforts to generate adjusted indices of HSC abundance from trawl surveys to control for factors known to influence HSC capture rates: seasonality, trawl depth, salinity, and temperature (note that dissolved oxygen also emerged as an important factor in the New Jersey trawl surveys; Fig. 10).

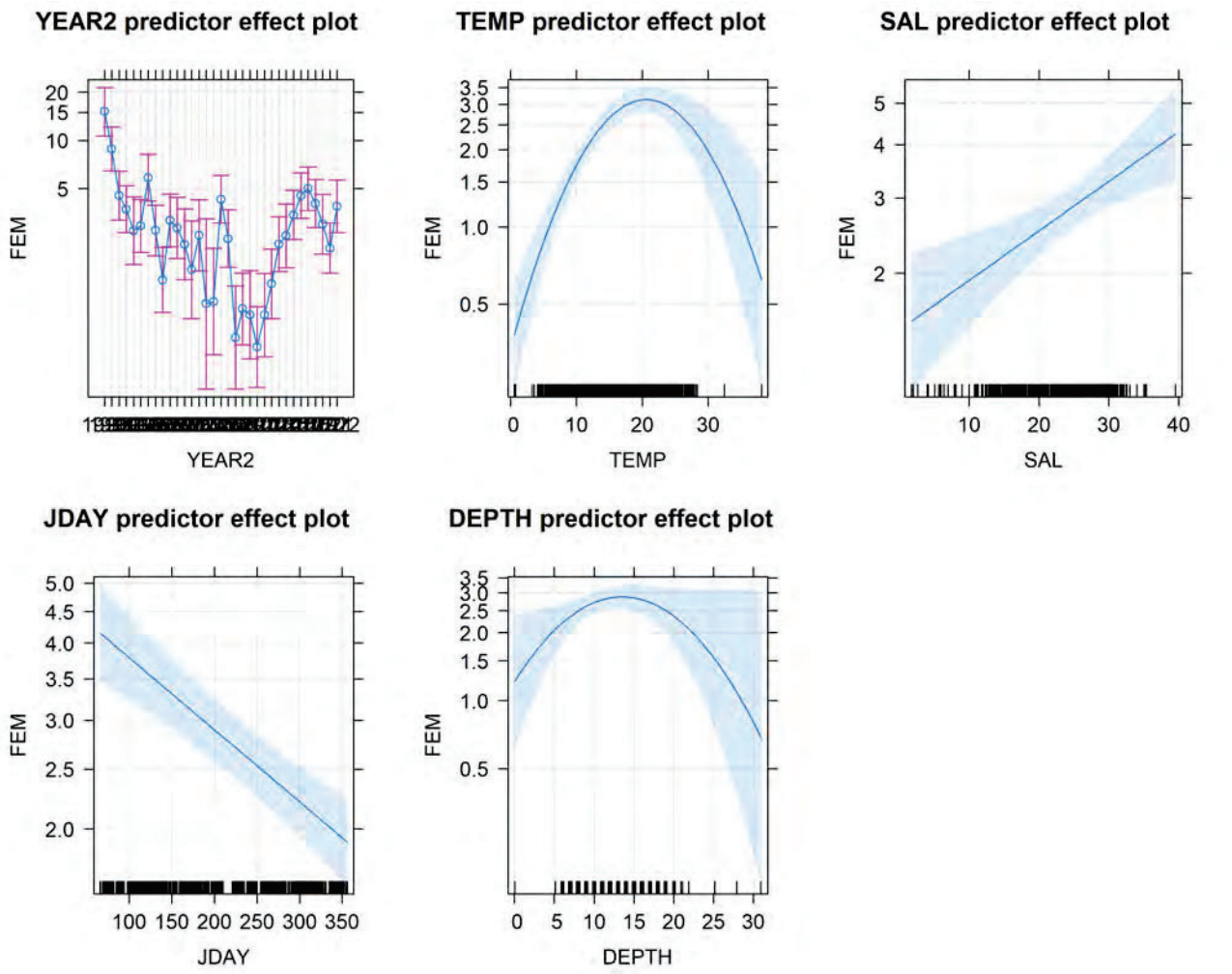


Figure S3*. Effects plots illustrating strong linear and non-linear effects of season and environmental covariates (from top left to bottom right: year, temperature, salinity, Julian day, and trawl depth) on the results of the Delaware Bay trawl surveys conducted by the state of DE. These figures are predictions from a generalized linear model (GLM) using a negative binomial error distribution, quadratic terms to represent non-linear relationships, and an offset term to accommodate differing effort among surveys (amount of seafloor surveyed). The 'rug' on each plot illustrates the distribution of data for each quantitative covariate. DE trawl data were provided on Aug 10, 2023 by Delaware Division of Fish & Wildlife, Delaware Department of Natural Resources and Environmental Control. This work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife*

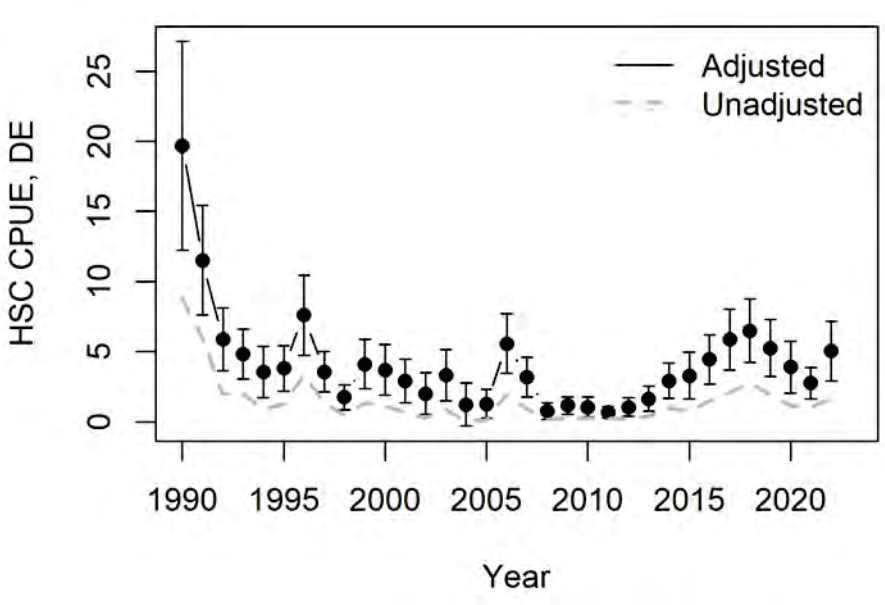


Figure S4*. Annual HSC catch-per-unit-effort (CPUE; a type of abundance index) for trawl surveys conducted by the state of Delaware from 1990 to present. Solid black dots are adjusted for the effects of seasonality, water temperature, depth, and salinity, while dashed gray line represents the unadjusted CPUE. Error bars represent one standard error on either side of the adjusted CPUE estimate. Unlike for the NJ data, the correction does not alter the general pattern of HSC abundance versus the unadjusted CPUE. DE trawl data were provided on Aug 10, 2023 by Delaware Division of Fish & Wildlife, Delaware Department of Natural Resources and Environmental Control. This work does not represent the opinions of the State of Delaware, Delaware Department of Natural Resources and Environmental Control or Delaware Division of Fish & Wildlife*

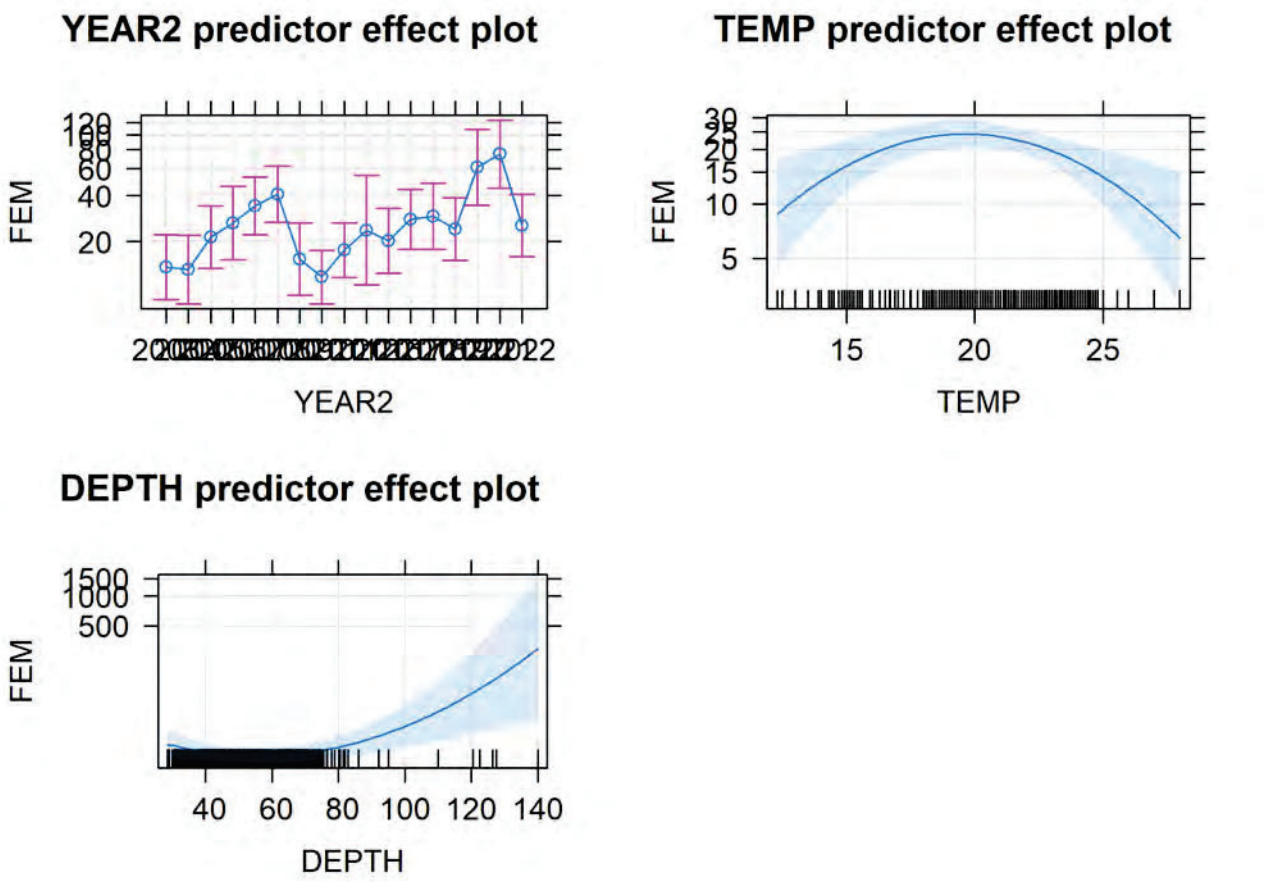


Figure S5*. Effects plots illustrating strong effects of year and environmental covariates (temperature and trawl depth) on the results of the Delaware Bay trawl surveys conducted by Virginia Tech (VT). These figures are predictions from a generalized linear model (GLM) using a negative binomial error distribution, quadratic terms to represent non-linear relationships, and an offset term to accommodate differing effort among surveys (amount of seafloor surveyed). The 'rug' on each plot illustrates the distribution of data for each quantitative covariate.*

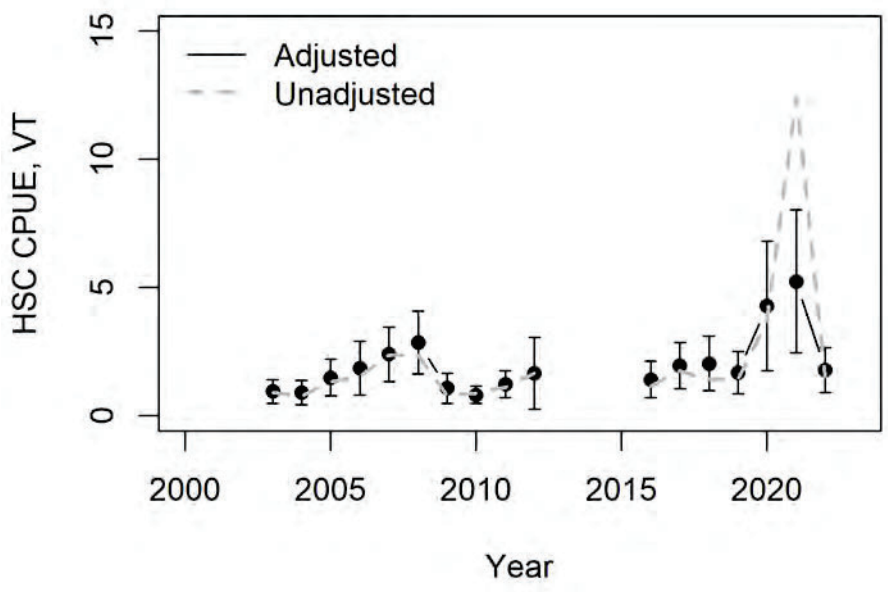


Figure S6*. Annual HSC catch-per-unit-effort (CPUE; a type of abundance index) for trawl surveys conducted by Virginia Tech from 2003 to present. Solid black points are adjusted for the effects of seasonality, water temperature, and depth, while dashed gray line represents the unadjusted CPUE. Error bars represent one standard error on either side of the adjusted CPUE estimate. Unlike for the NJ data, the correction does not generally alter the pattern of HSC abundance versus the unadjusted CPUE.*

Open robust design (ORD) validation tests

In this section, I report validation tests for assessing the ability of the open robust design (ORD) model to estimate the known values of key parameters (like survival) from simulated band-resighting data. In general, the ORD model successfully recovered the true parameters used to simulate the data, indicating that this model was correctly specified and capable of estimating parameters correctly. Overall, the ORD model was able to estimate many parameters related to survival, temporary emigration, the timing of stopover arrivals and departures, and detection probability (Figs S7-10). However, while the ORD model appears to perform well in simulation tests, recall that goodness of fit (GOF) tests showed that this model was not an adequate representation of the observed REKN data from Delaware Bay (see section 6, above). In addition, issues with potential misread errors further compromised the validity of the results (see above).

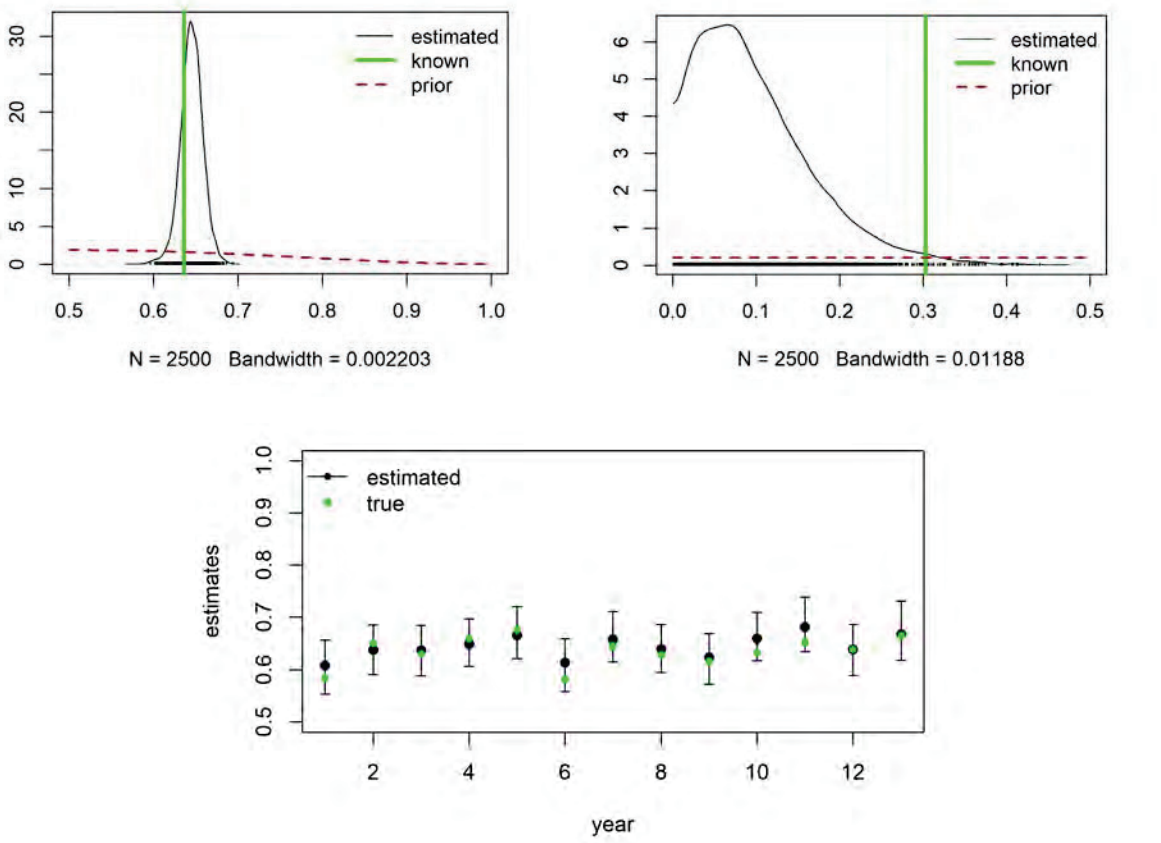


Figure S7*. In simulation tests, the ORD model seems to do a good job of recovering true mean survival (top left) from simulated data. The ORD model frequently fails to capture the true variance in survival (top right), leading to some concern about its ability to model annual variation in survival. However, the model performs well in capturing true annual survival values (bottom). Green dots and vertical lines represent the true values used in simulations, black curves, points, and confidence intervals represent parameter estimates from the ORD model, and dashed brown curves represent the prior probability distributions used for Bayesian model fitting.*

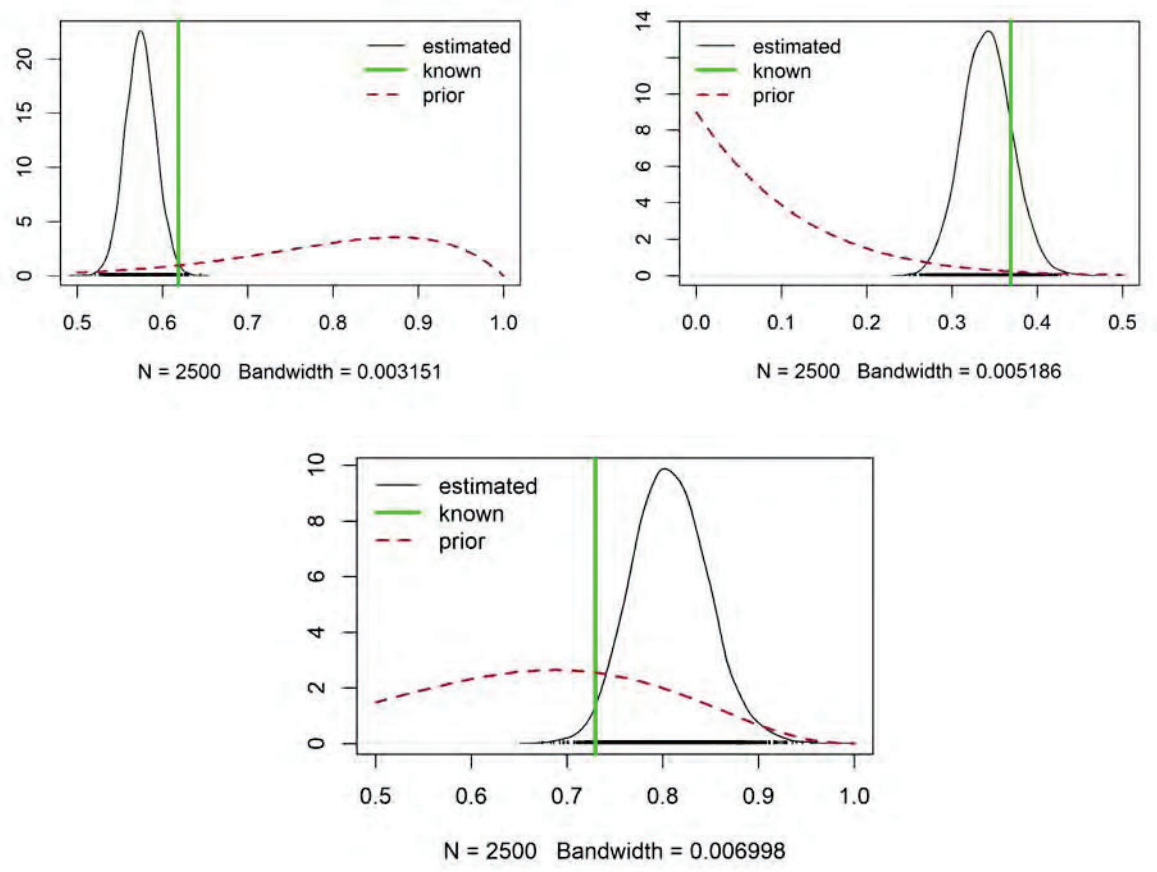


Figure S8*. In simulation tests, the ORD model tended to perform moderately well at recovering the true gammaII term (temporary emigration- prob of returning to the stopover after using it last year) from simulated data (top left), GammaOI term (temporary emigration- prob of returning to the stopover after skipping last year) (top right) and Tau (stopover residency probability) (bottom panel). Green dots and vertical lines represent the true values used in simulations, black curves, points, and confidence intervals represent parameter estimates from the ORD model, and dashed brown curves represent the prior probability distributions used for Bayesian model fitting.*

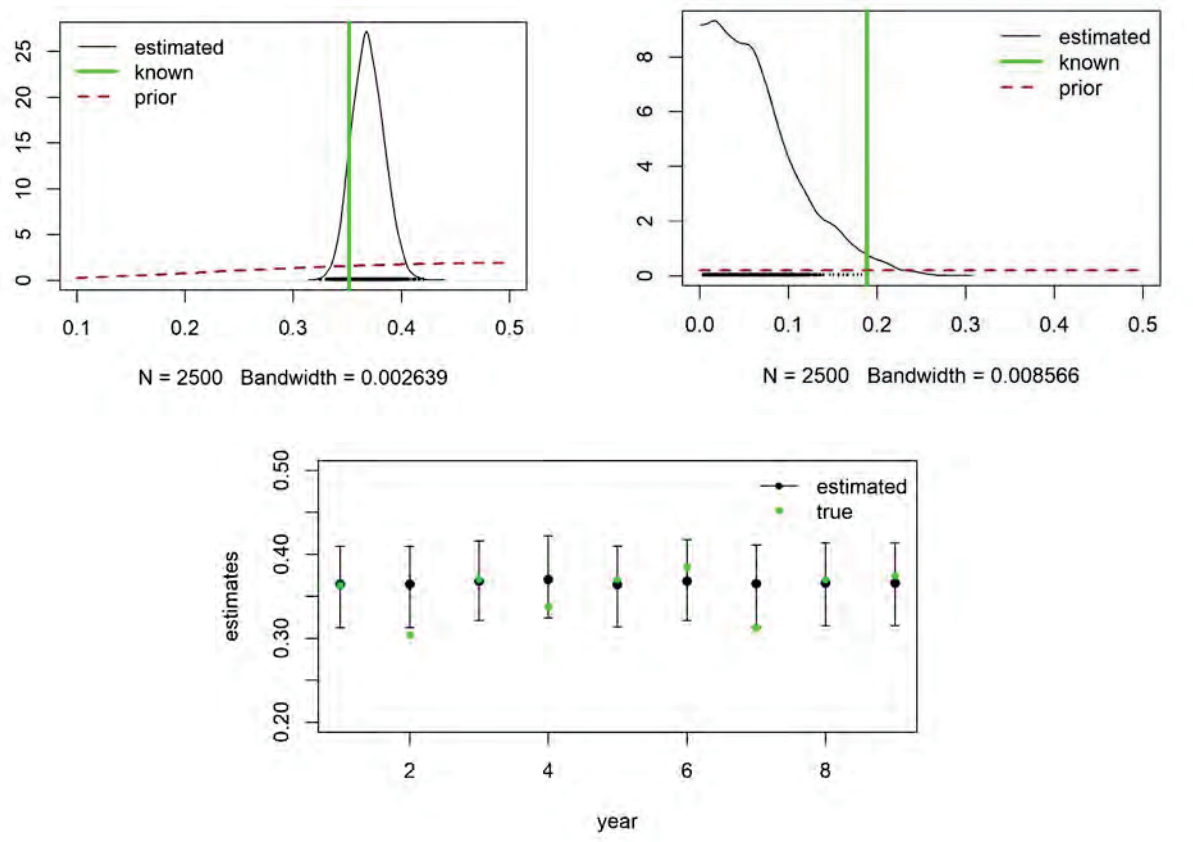


Fig. S9. *In simulation tests, the ORD model tended to perform moderately well at recovering the true temporal mean detection probability (top left). However, the ORD model performed somewhat poorly at recovering the temporal process variation in p (variation across both primary and secondary occasions); this parameter doesn't seem to fit well, and the chains exhibited very slow mixing. The bottom panel indicates detection probability per 3-day sampling occasion; the model appears to be underestimating variation among secondary occasions. Green dots and vertical lines represent the true values used in simulations, black curves, points, and confidence intervals represent parameter estimates from the ORD model, and dashed brown curves represent the prior probability distributions used for Bayesian model fitting.*

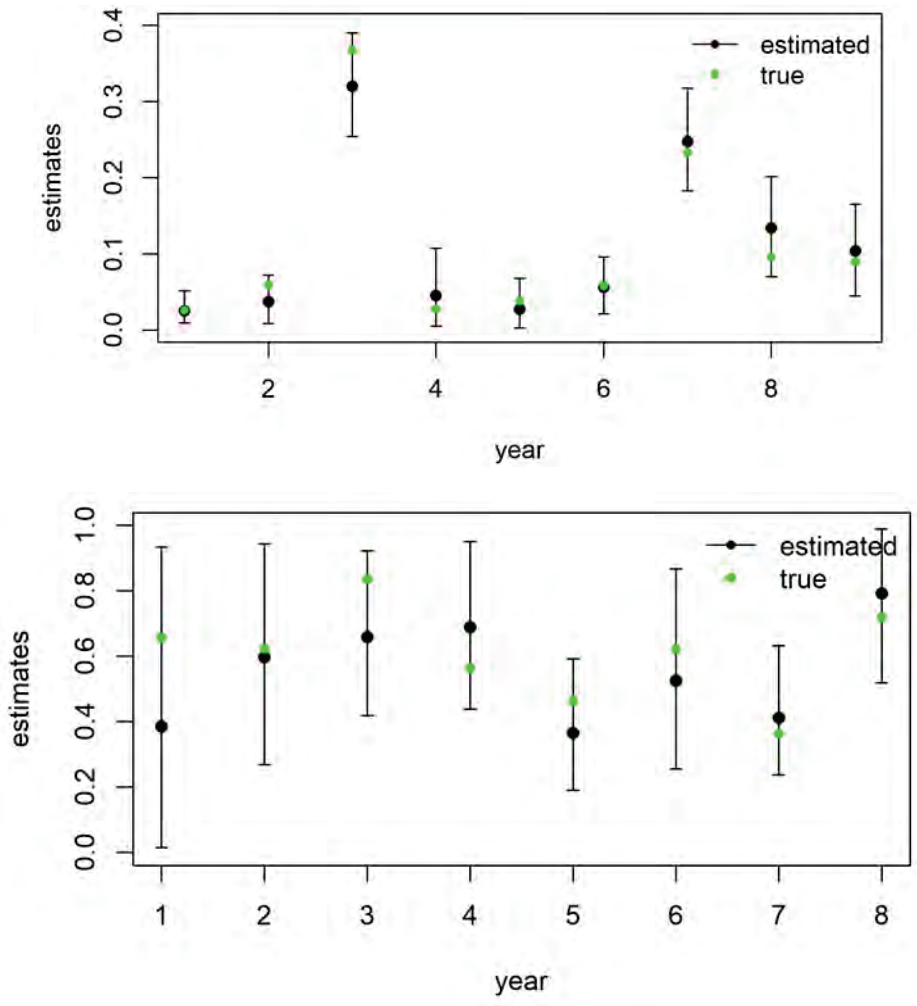


Fig. S10. *In simulation tests, the ORD model tended to perform moderately well at recovering the 'Delta' parameter (entrance probabilities) (top panel)— here, estimated from simulated data for year 8 (selected randomly from among years). The ORD model also performed well in recovering information about the 'Psi' parameter (probability of stopover persistence) (bottom panel). The green dots and vertical lines represent the true values used in simulations, while black curves, points, and confidence intervals represent parameter estimates from the ORD model.*

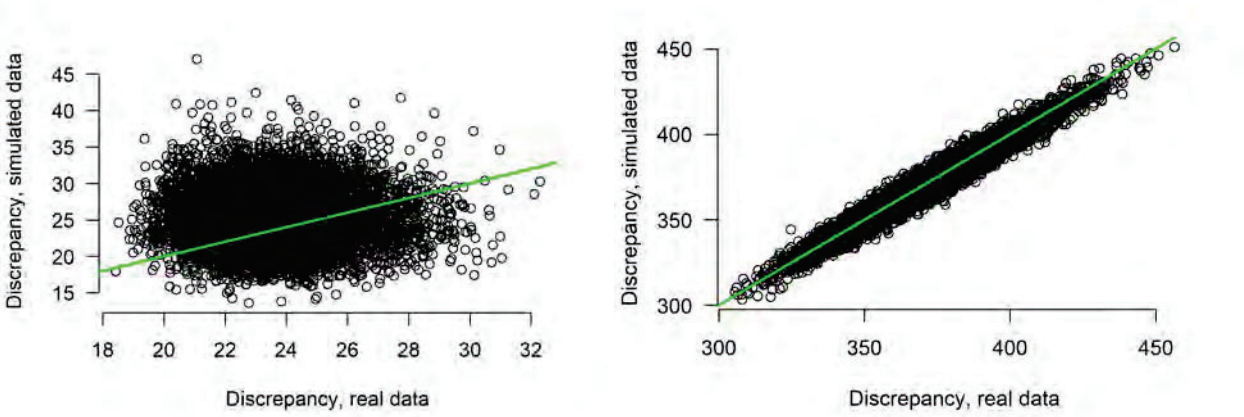


Fig. S11*. In simulation tests, the open-robust-design (ORD) model exhibited adequate goodness of fit, demonstrated here through posterior predictive checks (PPCs) involving the among-year survival process (L1; left panel) and the timing of first entry to the stopover each year (L2; right panel). The ORD model passed all four GOF tests when data were simulated using the same model assumptions used for model fitting (two tests not shown). In contrast, when the real REKN mark-resight data were used for model fitting, these tests indicated poor model fit (see section 6, above).*

Exhibit M

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

ASSOCIATES OF CAPE COD, INC. and JAY HARRINGTON, Plaintiff, v. THE U. S. DEPARTMENT OF THE INTERIOR, U.S. FISH & WILDLIFE SERVICE, THE NATIONAL PARK SERVICE, et al., Defendants.	Civil Action No. 00-10549-RWZ

DEFENDANTS' NOTICE OF COMPLETION OF PROCEEDINGS ON REMAND

EXHIBIT 1

COMPATIBILITY DETERMINATION
HORSESHOE CRAB HARVESTING
IN MONOMOY NATIONAL WILDLIFE REFUGE
MAY 23, 2002

&

TRANSMITTAL CORRESPONDENCE
TO JAY A. HARRINGTON
JUNE 4, 2002

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Eastern Massachusetts National Wildlife Refuge Complex
73 Weir Hill Road
Sudbury, Massachusetts 01776
(978) 443-4661
Fax: (978) 443-2898

June 4, 2002

Mr. Jay A. Harrington
P.O. Box 321
South Orleans, MA 02662

Dear Mr. Harrington:

This letter serves to inform you that the United States Fish and Wildlife Service (Service) has completed the enclosed Final Compatibility Determination for the harvesting of horseshoe crabs on Monomoy National Wildlife Refuge (NWR). The Service has determined that this use is not compatible with the purposes of Monomoy NWR nor with the mission of the National Wildlife Refuge System. Accordingly, as explained in more detail below, **your Special Use Permit to harvest horseshoe crabs on Monomoy NWR is no longer valid, and you are prohibited from harvesting horseshoe crabs on the Refuge effective immediately**.

Under Federal law, allowing uses on national wildlife refuges requires that the Service determine that they are compatible. A compatible use is a proposed or existing use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge. Compatibility determinations are developed to document and facilitate evaluation of such uses.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. The primary purposes of Monomoy National Wildlife Refuge are to protect migratory birds and preserve the wilderness character of the Monomoy Islands. The Refuge's strategic location on the Atlantic Flyway makes it a valuable stopover and staging area for migrating populations of many waterfowl, passerine, and shorebird species.

In February, 2002, a draft compatibility determination was released for public review. The comment period lasted from February 1 - March 25, 2002. In addition, a public meeting was held

on March 21, 2002. A total of 163 comments were received. The issues resulting from the comments, and copies of the comments are included in Appendix A. Where noted, the compatibility determination was changed to address the comments.

This determination is effective immediately, and subject to a mandatory re-evaluation in 2012. This determination and invalidation of your permit is in accordance with the Judgement of the Court of June 25, 2001 in the Action of Associates of Cape Cod, et. al. V. Bruce Babbitt et. al., Civ. A. No. 00-10549-RWZ, as the Service has made a valid non-arbitrary determination that harvesting horseshoe crabs from the Refuge is not compatible with the purposes of the Refuge.

Sincerely,

Bud Oliveira
Project Leader
Eastern Massachusetts National Wildlife Refuge Complex

Compatibility Determination
Eastern Massachusetts National Wildlife Refuge Complex

Background: The National Wildlife Refuge System Improvement Act (NWRSIA) of 1997, codified at 16 U.S.C. § 668dd-ee, amends the National Wildlife Refuge System Administration Act (NWRSAA) of 1966. The NWRSIA clearly establishes wildlife conservation as the singular National Wildlife Refuge System mission. In addition, it provides a mechanism for refuge planning, gives guidance for management, and gives refuge managers uniform direction and procedures for making decisions regarding wildlife conservation and uses of the National Wildlife Refuge System. The NWRSIA required, at 16 U.S.C. § 668dd(d)(3)(B), that the Secretary of the Interior issue new regulations for the process of determining whether a use on a national wildlife refuge is compatible, including re-evaluation of existing uses and opportunities for public comment. The Notice of the Final Compatibility Policy 65 F.R. § 62482 and the Final Compatibility Regulations published on the same date at 65 F.R. § 62458, are both effective as of November 17, 2000.

In 1994, a compatibility determination for harvesting horseshoe crabs (*Limulus polyphemus*) for biomedical use on Monomoy NWR was written under the old regulations, which have been recently amended (50 C.F.R parts 25, 26, and 29), pursuant to the 1997 amendments to the NWRSAA. In 50 C.F.R. § 25.12 (g) it states that " . . . we will re-evaluate compatibility determinations for all existing uses other than wildlife dependent recreational uses when conditions under which the use is permitted change significantly, or if there is significant new information regarding the effects of the use . . . In addition, a refuge manager always may re-evaluate the compatibility of a use at any time." At 50 C.F.R. § 25.12 (i) it states that during re-evaluation, " . . . we will take a fresh look at the use and prepare a new compatibility determination following the procedure outlined in 50 C.F.R. § 26.41." This compatibility determination is warranted because conditions under which the use was permitted have changed and there is new information relative to the effects of the use that were not considered during the compatibility determination in 1994.

Use: Horseshoe Crab Harvesting

Refuge Name: Monomoy National Wildlife Refuge (Monomoy NWR or Refuge)

Establishing and Acquisition Authority (ies):
- 16 USC §715d - Migratory Bird Conservation Act
- Public Law 91-504, 16 USC § 1132(c) - An Act to Designate Certain Lands as Wilderness

Refuge Purpose(s):
- for use as an inviolate sanctuary, or for other management purpose, for migratory birds (Migratory Bird Conservation Act)
- to preserve the wilderness character of the Monomoy Islands (An Act to Designate Certain Lands as Wilderness)

National Wildlife Refuge System Mission: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (NWRSAA as amended by16 U.S.C. § 668dd-ee).

Description of Use and Background: The proposed use is harvesting of live horseshoe crabs from Monomoy NWR for: 1) use as bait (either sold or in personal fishing pots) in commercial fisheries (generally for whelk [*Busycon* spp.] or American eel [*Anguilla rostrata*]), 2) bleeding at a biomedical facility and subsequent return to Monomoy NWR waters, and 3) any other collecting of live horseshoe crabs. None of these uses are priority public uses and, at present, harvesting of horseshoe crabs is largely for commercial uses. This compatibility determination will consider the effects of live harvest anywhere on Monomoy NWR (intertidal and subtidal areas) for any use.

Horseshoe crab harvesting for bleeding and bait has been taking place on Monomoy NWR for many years (AR, 3C, 161-163)[1]. Both types of harvesters generally collect horseshoe crabs from May - July during the high tides when horseshoe crabs move into the intertidal areas and shallow waters to spawn. Typically, harvesters either drag a small skiff behind them while walking in the shallow water, or move slowly in a boat through the shallow water. Horseshoe crabs are usually collected with a rake, or by hand. Both bait and biomedical harvesters prefer large horseshoe crabs (generally females) because they yield more blood for biomedical testing, or more bait for fishing (Novitsky 1984 [AR, 5A, 165-171], Shuster Jr. 1996 [AR, 5A, 326-335], Manion et al. 2000 [AR, 1D, 504-575]). However, males are also reportedly used, especially for bait for whelk potting (Atlantic States Marine Fisheries Commission [ASMFC] 1998a [AR, 4A, 107-163]). Horseshoe crabs used by the biomedical industry in Massachusetts are purchased from harvesters for about $2.00 each, and those used by the bait industry are purchased for $.65 to $1.00 each, depending on size (Unsworth et al. 2000 [AR, 1D, 577-624]). Most horseshoe crabs are collected from the northwest tip of South Monomoy Island, from the west side of North Monomoy Island and from Morris Island, where the majority of horseshoe crabs spawn (unpubl. data from Monomoy NWR).

While harvesting horseshoe crabs for bait for commercial fisheries has been ongoing on Monomoy NWR for many years, this use was never officially allowed on Refuge lands or waters. A compatibility determination was never completed for this activity, but due to staff limitations the existing closure was not effectively enforced until 2000. A lack of Refuge enforcement and monitoring, and lack of mandatory reporting requirements of harvest by Massachusetts until 1999, render it impossible to know how many individuals historically participated in this activity, and how many horseshoe crabs were harvested annually. However, during the spawning season of

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[1] References to information compiled as a part of the Administrative Record filed in *Associates of Cape Cod, Inc. and Jay Harrington v. Bruce Babbitt, et al.* Civ. Act. No. 00-10549-RWZ, will be cited as (AR [Administrative Record], [Volume] 3 [Section] C, [pages] 161-163). If a published document that is being referenced also appears in the Administrative Record, the location in the Administrative Record will appear in brackets immediately following the citation.

1999, there was a notable increase in horseshoe crab harvesting on Monomoy NWR. There were confirmed reports of harvesters illegally taking crabs from the Refuge at night (Monomoy NWR is closed from dusk to dawn to all users except surf casting fishermen [50 C.F.R. § 32.40]), and there were rumors that some of these horseshoe crabs were being transported to other states for sale as bait (AR, 3C, 159-163). Increased activity was evident in the form of: increased number of harvesting boats in surrounding waters; increased presence of skiffs filled with horseshoe crabs in local marinas and bays; and, increased presence of rental trucks at offloading locations. Permit holders have been required (since 1999) to report to the State of Massachusetts the number of horseshoe crabs harvested daily, location of harvest, gear used, and intended use (ASMFC 2001). In 1999 over 200,000 horseshoe crabs (roughly half of the total harvest reported in Massachusetts) were harvested from lower Cape Cod, and 125, 907 of these (25% of the total harvest reported in Massashusetts) were harvested from Monomoy NWR for use as bait in commercial fisheries (Diodati 2002). In 2000 and 2001, there were no reports of horseshoe crabs being harvested from Monomoy NWR by bait harvesters (F. Germano, Commonwealth of Massachusetts, Division of Marine Fisheries, Pocasset, MA. pers. comm.). Although the Refuge closure to harvesting for this purpose was enforced in 2000 and 2001, it is likely that some horseshoe crabs were still harvested. Because the increased harvesting activity is likely due to closures of areas in mid-Atlantic states (Manion et al. 2000 [AR, 1D, 504-575]) and closures of other traditionally used fisheries, it is reasonable to expect future harvesting pressure to increase in this area (AR, 3C, 159-163).

Harvesting horseshoe crabs from Monomoy NWR for use by the biomedical industry has been occurring for over a decade. Blood is extracted from horseshoe crabs for the production of *Limulus* amoebocyte lysate (LAL) (Novitsky 1984 [AR, 5A, 165-171]) which is used for the detection of endotoxins pathogenic to humans in all injectable drugs and implantable medical devices (Berkson and Shuster Jr. 1999 [AR, 5A, 580-586]). In the early 1990's, Associates of Cape Cod (ACC), a private biomedical company in Massachusetts, approached Monomoy NWR about harvesting horseshoe crabs (AR, 2A, 18-19). In 1991, Monomoy NWR issued a Special Use Permit to Mr. Jay Harrington[2] (supplier to ACC) to harvest horseshoe crabs in "closed areas" on the west side of North Monomoy Island, which is a subset of the Wilderness Area. The areas are traditionally closed every year from April - October for the protection of critical nesting and staging habitat for a variety of shorebirds and seabirds[3].

A second person requesting a permit in 1991 was denied a permit for the closed areas but was still allowed to harvest horseshoe crabs for bait elsewhere on Monomoy NWR which include areas

[2] References to Mr. Jay Harrington (J. Harrington) of Civ. Act. No. 00-10549-RWZ should not be confused with references to Mr. Brian Harrington (B. Harrington) of Manomet Center for Conservation Sciences. J. Harrington and B. Harrington are not related.

[3] The closed area is not conterminous with the Wilderness Area as it only includes an upper portion of the Wilderness Area which can be posted and signed by the Refuge staff, and which is not so close to mean low water that the sign posts would be washed out.

now mapped as lying within the Wilderness Area (AR, 2B, 139-142). Since 1991, J. Harrington was the only person granted a permit to harvest horseshoe crabs in the closed area (AR, 2A, 20-64; AR, 3C, 159-160). The permits issued to J. Harrington from 1991-1999 allowed him to collect horseshoe crabs for the sole purpose of selling them to ACC. The Special Use Permits stipulated that horseshoe crabs could only be collected during the day and surviving horseshoe crabs were to be returned to the water from where they were collected within 72 hours (AR, 2A, 20-64; AR, 3C, 159-163). In 2000, the U.S. Fish and Wildlife Service (USFWS or Service) denied J. Harrington a permit (AR, 2A, 89-90 and 115-116; AR, Add.D, 128-148). A court ordered temporary injunction allowed the continued harvesting of horseshoe crabs by J. Harrington in 2000 and in a 2001 judgement, USFWS was ordered to issue a permit to J. Harrington for 2001[4]. Harrington reported that 7,792 and 8,369 horseshoe crabs were harvested from Monomoy NWR in 2000 and 2001, respectively (J. Harrington 2000a and 2001).

Refuge Establishment: Monomoy NWR was established on June 1, 1944 through a Declaration of Taking by Secretary of the Interior (District Court of the United States for the District of Massachusetts, Misc. Civil No. 6340). This Taking extends from the mean low water line on the eastern shores of the Refuge to an area within Nantucket Sound identified by certain latitude/longitude coordinates (Attachment 1). At the time of establishment, Monomoy NWR consisted of 2,834 acres of upland and 5,934 acres of water and intertidal zone. Monomoy NWR's strategic location on the Atlantic Flyway makes it a major staging area for fall populations of many migratory waterfowl, passerine, and shorebird species.

Monomoy NWR is renowned for its shorebirds, especially the concentrations that stop-over during southward (fall) migration. The fall migration draws approximately 24 shorebird species to the Refuge. Growing evidence shows that there are relatively few stop-over areas such as Monomoy NWR where migratory birds can find suitable habitat for resting and feeding before continuing their migration (USFWS 1988 [AR, 1C, 307-490]). Although Monomoy NWR is utilized more by shorebirds during the fall migration, many species of shorebirds also stop-over during the spring migration. Shorebirds commonly seen on Monomoy NWR from April to October include: Black-bellied Plover (*Pluvialis squatarola*), Semipalmated Plover (*Charadrius semipalmatus*), Piping Plover (*Charadrius melodus*) (Federal-threatened species, listed by the

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[4] An extensive history of litigation on this issue regarding harvest of horseshoe crabs for the biomedical industry can be found in *Associates of Cape Cod, Inc. and Jay Harrington v. Bruce Babbitt, et al.* Civ. Act. No. 00-10549-RWZ. The Court directed that the Service allow the plaintiffs to harvest horseshoe crabs within Monomoy NWR in the manner described in the 1994 compatibility determination unless the USFWS either (1) makes a valid non-arbitrary determination that the plaintiff's activities lack compatibility with the purpose of the Refuge, or (2) has another valid non-arbitrary reason for denying the plaintiff's permit. The Court found that the USFWS's jurisdiction over the intertidal area is superior to the Colonial Ordinance of 1641-1647 (a provision of Massachusetts state law regarding intertidal access) and that the USFWS could prohibit the plaintiffs from harvesting horseshoe crabs within the boundary of the Wilderness Area.

Endangered Species Act), American Oystercatcher (*Haematopus palliatus*), Greater Yellowleg (*Tringa melanoleuca*), Lesser Yellowleg (*Tringa flavipes*), Willet *(Catoptrophorus semipalmatus*), Whimbrel (*Numenius phaeopus*), Hudsonian Godwit (*Limosa haemastica*), Ruddy Turnstone (*Arenaria interpres*), Red Knot (*Calidris canutus*), Sanderling (*Calidris alba*), Semipalmated Sandpiper (*Calidris pusilla*), Least Sandpiper (*Calidris minutilla*), Pectoral Sandpiper (*Calidris melanotos*), Dunlin (*Calidris alpina*), and Short-billed Dowitcher (*Limnodromus griseus*) (USFWS 2001a).

A 1984 report of the International Shorebird Survey cites Monomoy NWR among the five most important of 454 autumn shorebird stopover areas studied east of the Rocky Mountains (B. Harrington 1984 as cited in USFWS 1988 [AR, 1C, 307-490]). In addition to hosting thousands of shorebirds during migration, Monomoy NWR's specialized habitat supports high numbers of nesting species that nest in few other locations in Massachusetts, including Common Terns (*Sterna hirundo*), Roseate Terns (*Sterna dougallii*) (Federal-endangered species, listed by the Endangered Species Act), Piping Plover, American Oystercatchers and Willets (Megyesi 1996, USFWS 1996, Koch 1999 and 2000, USFWS 2001a).

On October 23, 1970, Monomoy NWR was afforded additional protection when most of the land and intertidal land within the Refuge was designated as Wilderness by Public Law 91-504. The Wilderness Area extends to mean low water. Two exceptions to the Wilderness Area designation are Inward Point (73 acres) and Powder Hole (137 acres). Although these two areas were excepted from the Wilderness designation, Congress expected the Secretary of the Interior to manage the entire area consistent with the concept of Wilderness (House of Representatives, Report No, 91-1441). Also, the seaward boundary of the Wilderness Area differs from the seaward boundary of the Refuge, because the Wilderness Area boundary runs along the mean low water line. Since this line shifts, the configuration of the Wilderness Area has undoubtedly changed over the past 30 years. In 2000, the Regional Survey Section for the USFWS conducted a Global Positioning System survey of Monomoy NWR along the mean high and mean low water lines (Attachment 1). In 2001, the survey was reviewed by the Chief Surveyor for the USFWS who found that the map was an accurate depiction of the conditions as of September 15, 2000 (Kopach 2002).

In 1999, Monomoy NWR was designated a Western Hemisphere Shorebird Reserve Network Site (WHSRN) because of its value to migratory shorebirds as a stop-over site. Established in 1986, "WHSRN recognizes critical shorebird staging areas through a voluntary, non-regulatory designation program" (B. Harrington 1999). Due to Monomoy NWR's relative importance to birds in Massachusetts, it was also designated an Important Bird Area (IBA) by Massachusetts Audubon Society. The purpose of IBA is to identify and protect sites that contain essential habitat for one or more species of breeding, wintering, or migrating birds (Goldberg and Hecker 2001).

1994 Compatibility Determination: In 1994, a compatibility determination (Attachment 2) found harvesting of horseshoe crabs for one person (J. Harrington) to supply the biomedical company (ACC) to be compatible (AR, 1C, 491-494) under the old regulations which were in

effect at that time (Refuge Recreation Act of 1962 and NWRSAA-1966). This compatibility determination relied on limited information and research that had been conducted on direct mortality associated with handling and bleeding horseshoe crabs. It concluded that the mortality was low enough that harvest would "not pose a threat to the current population". The compatibility determination specified that "releases will be conducted in the vicinity of the capture area to enable a resumption of their spawning activities", but didn't offer any research findings that showed horseshoe crabs would actually resume normal spawning activities when released. The compatibility determination also stated that the use "will be reevaluated should the demand for horseshoe crabs for this industry increase" (AR, 1C, 492).

2000 Evaluation of the 1994 Compatibility Determination: During the 1999 horseshoe crab spawning season, due in large part to concern expressed by various members of the public over the apparent increase in horseshoe crab harvesting activities on Monomoy NWR, Monomoy NWR staff began assembling information on the jurisdiction of the USFWS over the intertidal zone and waters within the entire boundary of Monomoy NWR (AR, 3C, 159-160). From discussions with Solicitors from the Department of the Interior, it was clarified that Monomoy NWR did in fact have the authority to regulate the intertidal areas east of the boundary line of taking (AR, 1C, 496-500). As a result, in November, 1999, Refuge staff issued a news release informing the public of the horseshoe crab harvesting closure to all harvesters on Monomoy NWR (AR, 1C, 501). In April, 2000, the Project Leader found the 1994 compatibility determination for harvesting horseshoe crabs for biomedical use no longer valid.

A lawsuit was filed on March 22, 2000 by J. Harrington over the closure of Monomoy NWR to the harvesting of horseshoe crabs for use by the biomedical industry. A temporary injunction, dated May 18, 2000, allowed J. Harrington to continue to harvest horseshoe crabs for use by ACC during the 2000 season. In its June 25, 2001 Judgement the Court ordered that J. Harrington be issued a permit for the 2001 season. The Court expressed concerns with the apparent inconsistency of the USFWS's prior permits to J. Harrington to harvest in the "closed area"and it found the Refuge Manager's decision to overturn the 1994 compatibility determination and to deny J. Harrington's 2000 permit to be arbitrary since it was based upon no new information other than that considered in the 1994 Compatibility determination.

The 1994 compatibility determination for harvesting horseshoe crabs for biomedical use was written under regulations which have been recently amended (50 C.F.R parts 25, 26, and 29), pursuant to the 1997 amendments to the NWRSAA. New compatibility regulations and policy were published in Federal Register / Vol. 65, No. 202 / Wednesday, October 18, 2000 and became effective on November 17, 2000. In 50 C.F.R. § 25.12 (g) it states that " . . . we will re-evaluate compatibility determinations for all existing uses other than wildlife dependent recreational uses when conditions under which the use is permitted change significantly, or if there is significant new information regarding the effects of the use . . . In addition, a refuge manager always may re-evaluate the compatibility of a use at any time." In addition, 50 C.F.R. § 25.12 (i) states that during re-evaluation, " . . . we will take a fresh look at the use and prepare a new compatibility determination following the procedure outlined in 50 C.F.R § 26.41."

Because circumstances under which the use was allowed have changed and there is new information relative to the effects of the use that were not considered during the compatibility determination in 1994, a new compatibility determination is warranted. This compatibility determination is subject to the new regulations. This document will determine the compatibility or non-compatibility of horseshoe crab harvesting for any use Refuge-wide (including both intertidal and subtidal areas), considering the following: 1) horseshoe crab life cycle; 2) horseshoe crab population trends coast-wide and in Massachusetts; 3) current uses of horseshoe crabs in Massachusetts; 4) anticipated impacts of harvesting on horseshoe crab populations; 5) shorebird population trends worldwide and in Massachusetts; 6) relationship between horseshoe crabs and shorebirds; 7) anticipated impacts of harvesting on shorebird populations; 8) anticipated impacts of harvesting on other flora and fauna in the ecosystem; 9) application of the Wilderness Act, new regulatory standards for management of the coast-wide and Massachusetts populations of horseshoe crabs, and for management of national wildlife refuges.

Horseshoe Crab Life Cycle: The American horseshoe crab is one of four extant species of horseshoe crabs; it is the only North American representative (Shuster Jr. 1982 [AR, 5A, 90-117]). The horseshoe crab is not actually a true crab, but is a member of an ancient group of arthropods, more closely related to spiders and scorpions, which predate dinosaurs by 250 million years. Horseshoe crabs have changed little since they adapted to their environment early in the history of life on earth (USFWS 1998a [AR, 3C, 295-296]). To understand potential impacts of harvesting horseshoe crabs on the population, it is important to consider its life cycle. In general, populations of species that are characterized by high reproductive potential (begin breeding at an early age, breed often, and produce a large number of offspring or have high survivorship to reproductive age) are likely to reproduce quicker (Campbell 1990) and better sustain consumptive harvest pressures than species characterized by low reproductive potential. Horseshoe crabs are slow to reach sexual maturity (Shuster Jr. 1982 [AR, 5A, 90-117]). Although female horseshoe crabs lay thousands of eggs each spawning attempt, it is unknown how many of these eggs result in mature, reproducing horseshoe crabs.

Horseshoe crabs first spawn at 9-10 years of age (Shuster Jr. 1982 [AR, 5A, 90-117], USFWS 1998a [AR, 3C, 295-296]). Spawning occurs on sandy beaches around new and full moon high tides from May through June (Shuster Jr. 1982 [AR, 5A, 90-117], Shuster Jr. and Botton 1985 [AR, 5A, 172-176], Barlow et al. 1986 [AR, 5A, 177-187]) although, in years when spawners appear to be relatively high in abundance, they seem to spawn on almost any high tide even into August (Shuster Jr. 2000). Usually many more males than females come ashore to spawn (Shuster Jr. 2000). The adult female will dig down into the sand and lay clutches of eggs that become mixed with sand grains. A typical egg cluster, about the size and shape of a flattened golf ball, contains about 4,000 eggs (USFWS 1998a [AR, 3C, 295-296]). The nests occur in a wide band of the beach from just above the foot of the beach to the high tide line at depths up to 20cm in the sand (Shuster Jr. and Botton 1985 [AR, 5A, 172-176], Penn and Brockmann 1988 as cited in Shuster Jr. 2000). Beach geochemistry, local tidal rhythms, predation and intraspecific competition for nesting space probably all affect nest site selection (Penn and Brockman 1994). Storms can affect reproductive success by preventing adults from spawning or washing out nests that have already been laid (Shuster Jr. 1958 as cited in Shuster Jr. 2000, Shuster Jr. 2000).

Shuster Jr. and Botton (1985, as cited in Shuster Jr. 2000) note that after a female lays 80,000 to 100,000 eggs during several high tides, she returns to deeper waters.

Newly laid eggs are soft and sticky. The coat of the egg hardens in contact with seawater (USFWS 1998a [AR, 3C, 295-296]). Larvae hatch within four weeks after fertilization (Botton 1995 [AR, 5A, 315-321]). Larvae remain in the sand for several weeks and then begin moving towards the beach surface (Rudloe 1979 as in Penn and Brockmann 1994). Within two weeks, they molt into juveniles (Sekiguchi et al., 1982 as in Penn and Brockmann 1994). During the first summer, juvenile horseshoe crabs generally live in shallow waters near the shore, but undergo multiple molts, and disperse over the tidal flats moving in an offshore direction (Shuster Jr. 1979 [AR, 5A, 65-78]). The larger the animal the further it is from shore. Adults return annually to spawn on beaches and may do so for at least eight years (Shuster Jr. 2000). Horseshoe crabs may live as long as 15-20 years (USFWS 1998a [AR, 3C, 295-296]).

Natural causes of mortality include age, energy use during spawning, stranding, and predation (ASMFC 1998b [AR, 4A, 176]). Loveland et al. (1996 [AR, 5A, 413]) reports that, "Natural mortality among adult horseshoe crabs probably is very low while they are dispersed on the continental shelf." Once the crabs reach the spawning beaches, however, natural mortality increases mainly due to beach stranding. However, human actions probably account "for the greatest proportion of adult horseshoe crab mortality" (ASMFC 1998b [AR, 4A, 176]). The abundance and distribution of horseshoe crabs has been influenced significantly by commercial fishing. Botton and Ropes (1987 [AR, 5A, 188-191]) report that commercial fishermen have purposely destroyed horseshoe crabs because of their ability to prey on soft-shell clams. Until recently, regulations prohibiting placement of horseshoe crabs below the high water mark, were still in place in Chatham. "No starfish, horseshoe crab, conches, wrinkles, or moonsnails shall be returned to the waters, but shall be placed on shore above the high water mark" (Town of Chatham Shellfish Regulations 1999 [AR, 4C, 392]). This section was repealed in April, 2000 (AR, 4C, 388). Studies have also investigated importance of geochemical and erosional factors in the selection of breeding beaches by horseshoe crabs. Results indicate that spawning activity is lower in areas with peat beds. Extensive bulkheading of eroding sandy beaches along several New Jersey shore communities has restricted the availability of suitable spawning habitat, making the remaining stretches of optimal sandy beach critical for reproductive success (Botton et al.1988 [AR, 5A, 221-228]). Coastal development and beach stabilization *(e.g.* revetments, groins, bulkheads) have reduced the availability of spawning habitat in Delaware Bay (Botton et al. 1988 [AR, 5A, 221-228], Botton 1995 [AR, 5A, 315-321), and it is likely that spawning habitat on Cape Cod has similarly been affected (James-Pirri et al. 2001).

In conclusion, the horseshoe crabs' reproductive strategy makes them vulnerable to over harvest. Horseshoe crabs congregating on beaches, during high tides to reproduce, are easily collected by harvesters in large quantities. Horseshoe crabs moving from deeper waters and subtidal areas to intertidal areas on Monomoy NWR are also vulnerable to this type of harvest. In the past, harvest for bait and biomedical use on Monomoy NWR has coincided with the spawning activity of horseshoe crabs and their movement into the shallow intertidal areas to reproduce. The gentle topography of the west side of North Monomoy Island and the north tip of South Monomoy

Island, allows horseshoe crabs in the subtidal areas to be easily harvested. Horseshoe crabs collected from the subtidal areas of the Refuge during this time of year, especially close to the intertidal areas, are likely adults. In addition, because horseshoe crabs do not mature for nearly a decade, a heavily exploited population will recover slowly (Loveland et al.1996 [AR, 5A, 411-418]).

Horseshoe Crab Population Trends Coast-wide: Distribution of the American horseshoe crab extends along the Atlantic coast and the Gulf of Mexico from northern Maine to the Yucatan Peninsula (Shuster Jr. 1982 [AR, 5A, 90-117]). Observations of American horseshoe crabs have been made since 1585 (Shuster Jr. 1950 [AR, 5A, 22-28]), but only a generalized account of the species' populations can be portrayed. Say reported in 1818 (as cited in Shuster Jr. 1979 [AR, 5A, 65-78]) that the species was "common and abundant" along the east coast of the U.S. Shuster Jr. (1979 [AR, 5A, 65-78]) suggested that each major estuary along the coast has a discrete horseshoe crab population, which can be distinguished from one another by adult size, carapace, color, and eye pigmentation. The size of the adults and the size of the populations show a distinct latitudinal gradient. Larger animals and populations are located in the middle of the species' distribution (Maryland to New York) and smaller animals and populations are found in the southern and northern extent of its range (north of Cape Cod, Massachusetts and south of Georgia) (Shuster Jr. 1982 [AR, 5A, 90-117]).

Determining the impact that the proposed uses will have on the horseshoe crab population requires consideration of population trends throughout their range on the Atlantic coast, in addition to careful analysis of population trends more locally. Trends in other parts of their range could be indicative of future trends in Massachusetts. However, a panel of biologists with expertise in horseshoe crab biology recently reviewed ASMFCs data sets used in a stock assessment report (ASMFC 1999a [AR, 4A, 250-319]) and noted that, " . . . there was no single data set deemed reliable enough to provide any coast-wide information for use in the horseshoe crab stock assessment. For this reason, it is necessary to review data sets provided for portions of the coast. While it is not appropriate to extrapolate these results to the entire coast, it is appropriate to investigate what can be inferred by the examination of these more limited data sets" (ASMFC 1998c [AR, 4A, 242]).

Probably the most intensively studied and monitored population occurs in Delaware Bay, which is estimated to have the largest spawning population of all the estuaries along the Atlantic coast (Shuster Jr. 1996 [AR, 5A, 326-335]). The horseshoe crab has long been economically important (despite its lack of food value to humans), and the amount of harvest and population information available from Delaware Bay may be due in part to the fact that much of the industry has centered there. "Crabs were ground into livestock feed and fertilizer between the 1870's and 1920's . . . " (Shuster Jr. and Botton 1985 as cited in Botton and Ropes 1987 [AR, 5A, 189]). Shuster Jr. (1996 [AR, 5A, 326]) writes that " . . . even in the 1870s, at least 4 million adults were collected each year. . ." By the 1960s, economic considerations, public complaints about offensive odors, and possibly diminishing stocks, all contributed to the decline of the industry. "It has been the use of horseshoe crabs as bait in the American eel and conch fisheries, along with the resurgence of the crab population since the 1960s, that has lead to increasingly heavy annual harvests of these

crabs from Delaware Bay and the continental shelf. In addition, "commercial interest in the species was further revived in the 1970's by the discovery that its blood coagulates in the presence of minute quantities of gram-negative bacterial endotoxin. This unique property has been exploited to develop a sensitive bioassay product, LAL" (Novitsky 1984 as in Botton and Ropes 1987 [AR, 5A, 189]).

The horseshoe crab population in Delaware Bay was estimated to be about 1.5 million from the 1880s through the 1920s. Beginning in the 1930s, the population declined until the 1960s. The lowest level of spawning crabs appears to be during the 1950s and 1960s with an estimated population of 42,000 crabs in Delaware Bay in 1961 (Shuster Jr. 1996 [AR, 5A, 326-335]). The 1977 peak population of spawning crabs in Delaware Bay was 222,000 males and 51,000 females, based upon a shoreline survey of spawning intensity along Delaware and New Jersey beaches. A recent study which looked at annual censuses of peak spawning activity of horseshoe crabs within Delaware Bay suggests a steady decline in the numbers of spawning horseshoe crabs. Estimates (each year) were about 1.2 million for 1990 and 1991 and 400,000 for 1992 and 1993 (Finn, Shuster Jr., and Swan 1991 / Hall and Shuster Jr. 1993, 1994 / Swan, Hall and Shuster Jr. 1993, 1994 all as cited in Swan 1995 [AR, 5A, 289-314]). By 1994 and 1995 only 100,000 crabs were estimated (Swan 1995 [AR, 5A, 289-314]). Although these surveys may not be directly comparable due to differences in methodology (ASMFC 1998c [AR, 4A, 235-249]), the data do suggest that the current spawning population is somewhere between the probable high of a century ago and the probable low in the 1960s.

Between 1990 and 1996, reported harvests in several states (e.g., New Jersey, Delaware, and Maryland) had increased, with several reported cases of localized declines in population levels. Responding to localized concerns about increased exploitation of horseshoe crabs, the ASMFC established an Interstate Fishery Management Plan for the horseshoe crab in 1998. ASMFC is a compact of the fifteen Atlantic Coast states, created "to promote the better utilization of the fisheries, marine, shell and anadromous, of the Atlantic seaboard by the development of a joint program for the promotion and protections of such fisheries" (ASMFC 1998b [AR, 4A, 174]). ASMFC began instituting reporting and restriction guidelines coast-wide, and, in light of evidence of an increase in harvest pressure coupled with data that suggest localized declines in relative abundance, the ASMFC has established caps on horseshoe crab landings, following a conservative, risk averse approach to managing this resource (ASMFC 1998b [AR, 4A, 164-231]). To provide additional protection, the National Marine Fisheries Service established a Marine Sanctuary and in February, 2001, announced a prohibition on horseshoe crab harvesting in a portion of Delaware Bay (66 F.R. 8906). "The intent of this final rule is to provide protection for the Atlantic Coast stock of horseshoe crab and to promote the effectiveness of the Atlantic States Marine Fisheries Commission (Commission) Interstate Fishery Management Plan (ISFMP) for horseshoe crab" (66 F.R. 8906).

Horseshoe Crab Population Trends in Massachusetts: Quantitative data for Massachusetts are scarce, even for the past 50 years. During the summers of 1949 and 1950, a tagging study of horseshoe crabs in Barnstable Harbor, Massachusetts, estimated the population was 50,000-100,000 (Shuster Jr. 1950 [AR, 5A, 22-28]). In the years 1952-1954, horseshoe crabs were also

tagged and released in or near Plum Island Sound in Massachusetts. Based on tag returns, population estimates ranged from 164,000 crabs in 1951 to about 1,000,000 in 1955. The population was of considerable magnitude even with rough numbers. (Baptist et al.1957 [AR, 5A, 30-49]). A 1956 study by Turner (as reported by Shuster Jr. 1979 [AR, 5A, 65-78]) indicated the population of horseshoe crabs in Cape Cod Bay to be over 100,000 adults. In addition, a 1958 observation notes that . . . "Limulus was frequently caught, by jet dredge, in the Horseshoe Shoal - Monomoy Point area and in the area off Edgartown Harbor. It is probable that these areas form the deep water component of the population frequenting the estuaries of the south shore of Cape Cod and the offshore islands" (Shuster Jr. 1979 [AR, 5A, 75]).

More recently, a study on Cape Cod, Massachusetts, which looked at horseshoe crab spawning activity of a population in Bourne found that the population had declined by more than 80% and spawning activity decreased by 95% from 1984 to 1999. In addition, the spawning period had shortened from 56 to 11 days. Researchers also found a substantial decrease in the number of spawning individuals at Stage Harbor (Chatham, Massachusetts) over a 5 year period, suggesting that the decline of horseshoe crab populations on Cape Cod may be widespread (Widener and Barlow 1999 [AR, 5A, 578-579]). Five years of information from Chatham Massachusetts can indicate a trend, although until surveys are completed throughout the life cycle of the horseshoe crabs, it is not known whether these declines represent a depression of only a few age-classes or a trend for all age-classes.

ASMFC (1998c [AR, 4A, 235-249]) lists priorities for beginning standardized data collection coast-wide. The first priority is to conduct spawning surveys of female spawners to provide an index of spawning population size. Over the past two years, researchers and Monomoy NWR staff have been collecting this data. Data on spawning populations of horseshoe crabs were collected from four Cape Cod regions: Nauset, Cape Cod Bay, Pleasant Bay, and Monomoy NWR. Quadrat sampling was used to monitor spawning densities during the late spring and summer of 2000 and 2001. Spawning surveys were conducted at Monomoy NWR at two locations (Morris Island and South Monomoy Island) in 2000 and at three locations (Morris Island, South Monomoy Island, and North Monomoy Island) in 2001. Similar spawning densities were obtained for the two years and amongst the three locations (Mary Jane James-Pirri, University of Rhode Island, Narragansett, RI, pers. comm.). Another study is being conducted on Cape Cod to determine the demographics of the horseshoe crab population, its habitat use and movements.

Limited information exists on spawning locations, spawning densities, age structure, fecundity, and mortality rates of horseshoe crabs in New England and on Cape Cod. Gathering this information is essential for the conservation and management of this species because it may differ between populations and regions (James-Pirri et al. 2001). Additionally, the Cape Cod spawning population may be discrete, semi-isolated (Widner and Barlow 1999 as cited in James-Pirri et al. 2001), and sensitive to local harvest and extirpation (James-Pirri et al. 2001). "Slow maturity rates, harvesting during spawning, the selective use of gravid females for bait, and potential of additional mortality related to bleeding create a possible scenario of over-exploitation that could result in the loss of sub-populations" (James-Pirri et al. 2001). Information suggesting a declining population and increased exploitation over the past decade does exist. The documented declines in

population abundance in Bourne and the apparent declining trend in Chatham over 5 years, coupled with consistent anecdotal information on increased harvesting activity for bait in the late 1990s, and the growth of the lysate industry over the last decade, all suggest that the population in Massachusetts may be declining over historic levels. Since 2000, there has been a decline in the number of horseshoe crabs harvested in Massachusetts as a result of harvest restrictions from the ASMFC and Interstate Fishery Management Plan. However, because horseshoe crabs do not reproduce for many years, impacts of heavy harvest pressure to the population may not be realized for many years.

Harvesting Horseshoe Crabs for Bait for American Eel and Whelk and Anticipated Impacts on the Horseshoe Crab Population: The bait fishery has historically been concentrated in the Mid-Atlantic, however a significant fishery had been growing coast-wide (Maine to Florida) as illustrated by the dramatic increase in commercial landings of horseshoe crabs from 1990-1996 (NMFS 1998 as cited in ASMFC 1999a [AR, 4A, 250-319]). Data from 1998 - 2000 is represented in numbers of horseshoe crabs landed (Michels et. al. 2001, DRAFT), and as such, is not directly comparable.

Year	Pounds	Value (in $1000s)
1990	908,130	101.81
1991	1,089,045	121.50
1992	1,000,619	109.71
1993	1,906,059	207.22
1994	1,401,656	228.60
1995	2,547,987	378.99
1996	5,153,630	1,541.26
1997	1,885,883	334.44

Year	# Landed
1998	2,756,949
1999	2,546,610
2000	1,903,415
2001	998,992[5]

Increases in fishing effort and harvest of horseshoe crabs is partly due to stricter regulations on other traditionally harvested groundfish, declines in other groundfish, and an increase in demand for whelk and American eel (ASMFC 1998c [AR, 4A, 235-249], Berkson and Shuster Jr. 1999 [AR, 5A, 580-586], Manion et al. 2000 [AR, 1D, 504-575]). In addition, whelk and American eel fisheries are not heavily regulated (ASMFC 1998c [AR, 4A, 235-249]). The demand for whelk meat has increased especially in the past 10-15 years (Manion et al. 2000 [AR, 1D, 504-575]).

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[5]The decline in landings observed from 1998 to 2000 are likely a result of the Interstate Fishery Management Plan mandates which included harvest restrictions for many States.

"Whelk meat is sold for consumption and commonly eaten with salads, sauces, or pasta. At present, the primary markets for whelk include domestic (primarily ethnic market) demand and international demand from Asia" (Manion et al. 2000 [AR, 1D, 523]). "The whelk pot fishery uses the largest portion (almost 90%) of horseshoe crabs destined for fisheries bait markets" (Manion et al. 2000 [AR, 1D, 548]). In 1998, an estimated 2.4 million horseshoe crabs were harvested for bait in the whelk pot fishery (Manion et al. 2000 [AR, 1D, 504-575]). In Massachusetts, the whelk fishery is predominantly in Barnstable, Briston, Plymouth, and Duke Counties (Manion et al. 2000 [AR, 1D, 504-575], Diodati 2002). American eel potting is widespread (every state from Maine to Florida), and in Massachusetts, occurs primarily in Barnstable County (Diodati 2002). "Domestic demand for eel as a food product is largely concentrated in ethnic and seasonal markets, although in recent years its appeal has expanded outside specialty markets. Domestic demand for eel as bait exists in both the recreational and commercial striped bass fisheries as live eels are considered among the best baits for catching striped bass. The growth of recreational striped bass fishing in recent years has greatly contributed to a significant increase in demand for live eels" (Manion et al. 2000 [AR, 1D, 542]). The use of horseshoe crab as bait in American eel potting varies. In 1998, 417,000 horseshoe crabs were used coast-wide for bait in American eel pots. In general, whelk pot fisherman rely on horseshoe crabs for bait more than American eel pot fisherman. Baiting with horseshoe crabs results in substantially more whelk, and accounts for 97 percent of the whelk pot landings. One female provides bait for 1-4 pots, and one male provides bait for 1-2 pots (Manion et al. 2000 [AR, 1D, 504-575]).

Historically, fishing regulations have varied dramatically among the Atlantic coast states. Generally, fishing regulations for horseshoe crabs have been minimal or nonexistent in comparison with other fisheries (ASMFC 1998b [AR, 4A, 164-231]). Reported coast-wide landings of horseshoe crabs were 2,756,949 in 1998. Several states initiated more restrictive harvest regulations in the late 1990's (New Hampshire, New Jersey, Delaware, Maryland, and Virginia). Conservation efforts in New Jersey, Delaware and Maryland substantially reduced landings in those states, but those efforts were negated by increased landings in Virginia where a large portion of the crabs were harvested and new landings in Pennsylvania which had no history of landings (ASMFC 1999b [AR, 4A, 339-345]). The State of South Carolina has prohibited harvest except for the biomedical industry since 1991. A 1998 ASMFC Management Plan called for developing a cap on landings for all Atlantic States by 2000. In 2000, an Addendum to the Plan required all states, except those that are deminimus (do not have a high enough harvest to restrict, but are still required to monitor and report: ME, NH, RI, NC, GA, FL) on the Atlantic Coast to cap their harvests at 25% below the 1995-1997 levels, however, this limit only applied to bait harvests. Each state is required to implement management measures and protect horseshoe crab habitat within its jurisdiction to ensure the sustainability of the population that either is produced or resides within state boundaries (ASMFC 2000b [AR, 4A, 362-363]).

Due to the lack of reporting requirements in Massachusetts until recently, and inconsistent tally methods during the past three years, harvest totals in Massachusetts prior to 1999 may be inaccurate and totals in following years must be cautiously compared [6]. In 1997 and 1998, an estimated 400,000 horseshoe crabs were landed in Massachusetts each year (ASMFC 1998b [AR, 4A, 164-231], Manion et al. 2000 [AR, 1D, 504-575]). In 1999, 440,503 horseshoe crabs were

reportedly landed in Massachusetts for bait (ASMFC 2000a). A 25% reduction applied to this number resulted in the Massachusetts quota of 330,377 crabs for bait fisheries in 2000 (ASMFC 2001). A total of 272,930 horseshoe crabs were landed in 2000 for bait, biomedical use and scientific research (ASMFC 2001). In 2001, a new permitting system allowed harvesters to collect horseshoe crabs for 1) biomedical use and subsequent return to the water or 2) biomedical use and subsequent use as bait or resold as bait (F. Germano, pers. comm.). The total number of horseshoe crabs harvested in 2001 for bait is 130,870 (Germano 2002). Horseshoe crab landings and totals from 1999-2001 are below (ASMFC 2001, Germano 2000 and 2002).

Location	1999	2000	2001
Martha's Vineyard	53,479	37,800	14,697
Nantucket	671	985	565
Upper Cape Cod	7,309	957	175
Mid Cape Cod	68,263	15,864	16,187
Lower Cape Cod	240,388	115,885	50,232
Buzzards Bay	55,659	28,012	13,568
Mount Hope Bay	13,495	6,670	117
Unknown Locations	22,335	29,716	0
Draggers	11,994	37,041	34,846
TOTAL	**473,593**[7]	**272,930**	**130,870**

The decline in harvest numbers from 1999 - 2001 " . . . is mainly due to the weekend closures, daily harvest limits, the 'use of biomedical crabs as bait' as well as the closures of Monomoy and Pleasant Bay, not a decline in crab populations" (Diodati 2002). However, declines in harvest landings due to regulatory restrictions does not eliminate the possibility of a downward horseshoe crab population trend.

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[6] The total number of horseshoe crabs harvested in 2000 includes those harvested for bait, biomedical use and scientific research. Changes in regulations in 2000 allowed some horseshoe crabs to be first used by the biomedical industry and then reused as, or sold as bait. However, tracking the ultimate disposition of many of these horseshoe crabs after use by the biomedical industry under the two scenarios (returned to the harvest location, or used or resold as bait) proved difficult. As a result, almost all harvested horseshoe crabs, for any purpose, were included in the total harvest number for Massachusetts in 2000. The only harvested horseshoe crabs omitted from the total are those harvested by J. Harrington for use by the biomedical industry because the disposition of these horseshoe crabs is known (they were returned to the water) (F. Germano, pers. comm.). The total number of horseshoe crabs harvested in Massachusetts in 2001 includes only those horseshoe crabs that were ultimately used for bait (Germano 2002). All horseshoe crabs ultimately used as bait are included in the totals from 1999-2001. Therefore, these numbers are comparable relative to the number of horseshoe crabs permanently removed from the water. However, in 2000 and 2001, these total numbers also include some horseshoe crabs which were ultimately returned to the water (2000) and some horseshoe crabs that were first used by the biomedical industry (2000 and 2001).

[7] This number reported by Germano (2000) is different than that reported by ASMFC (2000a). The number reported by Germano (2000) was preliminary and later modified by removing horseshoe crabs that were used for education and research from the total, and by slightly adjusting bait harvesters' reports (F. Germano, pers. comm.).

According to the Massachusetts Division of Marine Fisheries, 125,907 (25%) of the horseshoe crabs harvested in Massachusetts in 1999 came from Monomoy NWR (Diodati 2002), suggesting that about half of the reported landings for the Lower Cape Cod were obtained from the Refuge. The State of Massachusetts has not provided any indication of what percentage of horseshoe crabs harvested in 2000 or 2001 came from Monomoy NWR. In addition, reported harvests may be lower than the actual harvest as officials sometime note the lack of reporting by some harvesters. In 1999, 7 of 150 permittees did not report. In 2000, 25 of 175 permittees did not report. Harvesters not reporting in 1999 and 2000 reportedly did not fish. In 2001, 38 of 251 permittees did not submit reports and were denied harvesting permits for 2002 (ASMFC 2001, Germano 2000 and 2002, Diodati 2002).

The State of Massachusetts indicates in 1999 that 66% of the horseshoe crabs harvested state-wide were used by 52 whelk potters who harvested for bait to be used in their own pots for commercial whelk harvesting. An additional 25% of the harvest was either sold to Massachusetts bait dealers, or directly to Massachusetts whelk pot fishermen (Germano 2000). In 1999 there were 171 whelk fishermen in the state, and at least 36 harvesters (of 95 total harvesters which reported fishing) reported using Monomoy NWR to obtain their bait (AR, Add.D, 128-148). Harvesters indicate needing 10,000-15,000 horseshoe crabs for this use in one season (AR, 3C, 159-163).

Determining how many individual horseshoe crabs are removed from the population on Cape Cod, and have been removed from Monomoy NWR is difficult, since the industry has not kept records and the State of Massachusetts' summary statistics are too vague (referring to Lower, Mid, and Upper Cape Cod without geographic specificity) to draw conclusions about specific landing sites. Although Massachusetts has recently begun mandatory reporting, changes in permitting and reporting systems, and the fact that some harvesters are not forthcoming with harvest information, (AR, 3C, 159-160) prevent making direct comparisons between years. Harvest information compiled by the state depends upon the accuracy of self-reporting by harvesters (ASMFC 2001). In addition, most harvesters collect horseshoe crabs at night (when the largest number of spawning horseshoe crabs can be collected with minimal effort), making field monitoring and enforcement logistically difficult (AR, 3C, 159-160). Despite the recent enforcement of the closure on Monomoy NWR to harvesting of horseshoe crabs for commercial bait, it is likely that some horseshoe crabs were still harvested from this productive, traditionally used area.

While we do not know how many horseshoe crabs have been historically harvested from Monomoy NWR for commercial bait, Monomoy is obviously an important spawning site for horseshoe crabs, as evidenced by harvest totals. In 1999 Monomoy NWR yielded the highest harvest of horseshoe crabs anywhere in Massachusetts (AR, 3C, 192 and 425). Without population trend information for horseshoe crabs spawning on Monomoy NWR, and the lack of accurate harvest numbers, we do not know how past bait harvesting has affected recruitment, age-classes and sex ratio of the population. In addition, since harvesters generally collect horseshoe crabs during spawning activity, and gravid females are selected over males (Manion et al. 2000 [AR, 1D, 504-575]), there are likely cumulative effects to repeatedly removing gravid females from the population.

Horseshoe crab population declines in Delaware Bay may be due to increased harvest pressure (Swan 1995 [AR, 5A, 289-314], Shuster Jr. 1996 [AR, 5A, 326-335], Harrington and Shuster Jr. 1999 [AR, 5A, 587-592]). Earlier restrictions and closures in traditional harvesting areas in states south of Massachusetts may be partially responsible for the increase in harvest pressure in Massachusetts, and specifically at Monomoy NWR (AR, 3C, 159-163). However, more recently, State officials indicate that any increase in harvest was not the result of restrictions and closures in states south of Massachusetts. State records do not show crabs being exported from Massachusetts to Delaware Bay states, but do show that the Massachusetts bait market receives horseshoe crabs from these states, and are a net importer, with nearly 26,000 horseshoe crabs imported into Massachusetts in 2001 (Diodati 2002). However, anecdotal information in 1999 suggested that harvesters were harvesting horseshoe crabs in Massachusetts and then selling them in other states (AR, 3C, 159-163). These landings would not be reflected in the State of Massachusetts records unless these harvesters had obtained permits from Massachusetts. In addition, horseshoe crab population declines on Cape Cod have coincided with intensified harvesting of horseshoe crabs for the commercial bait fishery (Widener and Barlow 1999 [AR, 5A, 578-579]). There is no current information pointing to increasing horseshoe crab populations in other states or Massachusetts.

Biomedical Industry and Anticipated Impact on Horseshoe Crab Populations: Research on horseshoe crabs for use in the biomedical industry began in the early 1900s including eye research, surgical suture wound dressing development, and detection of bacterial endotoxins in pharmaceuticals (Hall 1992 as cited in ASMFC 1998a [AR, 4A, 107-163]). Blood is extracted from horseshoe crabs for the production of LAL. LAL is a clotting agent (Novitsky 1984 [AR, 5A, 165-171]) used for the detection of endotoxins pathogenic to humans in all injectable drugs and implantable medical devices (Berkson and Shuster Jr. 1999 [AR, 5A, 580-586]). "Horseshoe crabs have been used for biomedical research and product development since the early 1900s" (ASMFC 1999a [AR, 4A, 255]). Bleeding of "large numbers" of horseshoe crabs for LAL production began in the 1970s (Shuster Jr. 1962 as cited in Berkson and Shuster Jr. 1999 [AR, 5A, 580-586]). Manion et al. (2000 [AR, 1D, 522] writes, "In 1979, the U. S. Food and Drug Administration (FDA) established requirements for the pharmaceutical industry's use of LAL to test injectable drugs and intravenous devices (e.g., catheters) for endotoxin contamination. Today, all such products released to the U.S. market are screened for endotoxins with LAL, now considered the established standard for this type of testing. . . the global market for LAL grows by about eight to ten percent annually. (Demand from Europe, where requirements for end-product testing of pharmaceuticals are similar to those in the US, historically has accounted for most of overseas demand. As pharmaceutical sectors in developing countries are established industry experts expect that demand from these areas will account for a greater portion of total overseas demand). "

Currently, three U. S. companies provide 80-90 percent of LAL utilized throughout the world: Charles River Endosafe in South Carolina, BioWhittaker in Maryland, and ACC in Massachusetts (Manion et al. 2000 [AR, 1D, 504-575]). On average, biomedical companies pay about $2.00 for each horseshoe crab (Unsworth et al. 2000 [AR, 1D, 577-624]), and $200-$250 in revenue per horseshoe crab is generated. The revenue for all three companies combined is about $50-$60

million/year (Manion et al. 2000 [AR, 1D, 504-575]). The FDA estimates medical usage increased from 130,000 horseshoe crabs in 1989 to 260,000 in 1997. Thompson (1998) reported that the yearly harvest of crabs for biomedical use in South Carolina increased over 300% since 1991, when reporting requirements were instituted (ASMFC 1999a [AR, 4A, 250-319]).

Recently, however, new advances in the medical field have resulted in " . . . successfully cloning the enzyme that clots the blood of the horseshoe crab . . ." "In developing the technology to produce the enzyme in a controlled environment, the two researchers have found an alternative source of the sensor that is more stable and chemically consistent than nature's endowment. . . A patent for the discovery of the compound, called Factor C, has been filed in the United States. The technology for its production was licensed early this year to American biotech company BioWhittaker, which is keen to use it to develop sterility test and antibiotics." (National University of Singapore 2001). While it may be years before this product is approved by the FDA and produced in large quantities, this represents a future alternative to use of horseshoe crab blood.

Little information is available on the number of horseshoe crabs harvested in Massachusetts or Monomoy NWR that are used by the biomedical industry, although ACC is required by the State of Massachusetts to report names of harvesters, locations of harvest, and disposition of horseshoe crabs each month (ASMFC 2001). J. Harrington reports that in 2000 and 2001, 7,792 and 8,369 (respectively) horseshoe crabs were transported from Monomoy NWR to ACC (J. Harrington 2000a and 2001). He also reported using 16,495 horseshoe crabs from Pleasant Bay (Harrington 2000b). ACC has stated that it bleeds about 1,200 horsehoe crabs each day from the beginning of May through late August (about 144,000 crabs/season), and that most crabs are supplied from the Refuge and Pleasant Bay (AR, 3C, 161-163 and 181; AR, 5B, 79; AR, Add.D, 128-148). ACC has not provided the Service with any more specific information about its sources and current or historical numbers of horseshoe crabs utilized. It is unclear what the source is of the other 120,000-135,000 horseshoe crabs which ACC utilizes. ACC reportedly obtains horseshoe crabs from 3 licensed vendors who purchase horseshoe crabs from permitted harvesters (ASMFC 2001). A new reporting and permitting system initiated in Massachusetts in 2001 indicates that 20 permits in Massachusetts were issued solely for biomedical harvesting (Germano 2002). However, because permitted bait harvesters can also first sell horseshoe crabs for biomedical use, available data do not indicate the total number of harvesters supplying the biomedical industry nor the total number of horseshoe crabs used.

In 2001, the U. S. FDA revised its conditions to allow horseshoe crabs to be bought by the biomedical companies from a commercial bait harvester for bleeding, and then returned to the bait harvester. These horseshoe crabs are counted against the state's quota. Otherwise, the biomedical companies collecting under a biomedical permit have no limitations as long as they are releasing them. ASMFC (2001) writes that "One of ACC's vendors does obtain crabs from a bait dealer for bleeding. These crabs are then returned to the dealer to be sold as bait. ACC was granted an exemption by the FDA to use bait crabs for biomedical use." However, the Special Use Permits issued by USFWS to J. Harrington still stipulated that all horseshoe crabs collected from Monomoy NWR for the purpose of bleeding by ACC "will be released within 72 hours after capture" (AR, Add.D, 153; USFWS 2001b). Reports provided by J. Harrington indicated delays

which resulted in horseshoe crabs not being returned within 72 hours (J. Harrington 2000a). These delays may increase stress, mortality of horseshoe crabs, or failure of egg laying, but no studies have investigated these potential impacts.

Because horseshoe crabs used by J. Harrington have not been included in harvest totals, and because there were no reporting requirements for this industry until recently, the total number of horseshoe crabs used by ACC is unknown. It is also unknown what percentage of the horseshoe crabs used by the biomedical industry come from Massachusetts waters. However, given that the FDA estimated that the number of horseshoe crabs used by the biomedical industry doubled from 1989 to 1997, and harvest reported from South Carolina (location of one of the 3 major companies) increased by 300% in the last 10 years for this industry, it is likely that use by ACC, and its reliance upon horseshoe crabs harvested in Massachusetts, has also increased.

The full impacts of the biomedical industry's use of horseshoe crabs are also unknown. Because the number of horseshoe crabs harvested for this purpose is much less than those collected for the commercial bait fishery, and surviving horseshoe crabs are returned to the waters after bleeding, the impacts of this activity are certainly less than bait harvesting. However, it is still unclear what percentage of horseshoe crabs that are harvested and bled do not survive the process, and are therefore effectively removed from the natural population. Few studies have been conducted that evaluate the mortality associated with transporting, holding, bleeding and releasing horseshoe crabs, and unfortunately, these studies can not be applied directly to the Monomoy NWR population. No studies have been done on impacts to reproductive behavior following bleeding, and limited studies have been conducted on long-term survival following bleeding.

A study conducted by Rudloe (1983 [AR, 5A, 126-151]) was the first to attempt to evaluate the impact of this industry, in the form of direct mortality. The study included a field tagging experiment and an analysis of survival in the laboratory after bleeding. About 10,000 mature horseshoe crabs were collected and tagged. Half of the crabs were bled and then all were released. The study found 1.3% mortality associated with handling. In addition, tag returns indicated a 10% percent mortality for horseshoe crabs bled during the first year after bleeding. Animals recovered during the second year following bleeding showed a cumulative 11% mortality (an additional 1% over the first year returns). No bleeding mortality studies were conducted following Rudloe's work until recently.

"Because mortality rates in the capture and bleeding processes are poorly understood, the Atlantic States Marine Fisheries Commission mandated in 1998 that all biomedical companies actively bleeding horseshoe crabs estimate mortality rates resulting from their bleeding process" (Walls and Berkson 2000). A 1999 study conducted in South Carolina (Wenner and Thompson 2000) reported that bled crabs had an estimated risk of mortality that was 1.3 to 18.7 times greater than individuals that were not bled, and based on information from their treatment group, this translates into an 8 % mortality rate. Although information on mortality due to shipping and handling are scarce, Wenner and Thompson (2000) concluded that transport mortality to and from a biomedical facility was not significant, and may be less than 2 % (AR, Add.F, 213-302). The final study was conducted in Maryland from 1999-2001. Mortality of bled and unbled horseshoe crabs was

compared, and a 7.5% differential mortality was found between the two groups over the three years. (Jim Berkson, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA, pers. comm.). "Certainly the bait fishery is considered to have a more substantial impact on horseshoe crab populations than the biomedical industry" (Berkson and Shuster Jr. 1999, [AR, 5A, 583]), however, Wenner and Thompson (2000 [AR, Add.F, 227]) conclude "A significant risk of mortality is associated with biomedical industry processing."

The more recent studies conducted by Wenner and Thompson (2000 [AR, Add.F, 213-302]) and Walls and Berkson (2000) provide valuable information on potential mortality of bled crabs in their second year following bleeding. However, the findings of these studies may not be applicable to horseshoe crabs harvested from Monomoy NWR for use by ACC. Wenner and Thompson (2000 [AR, Add.F, 213-302]) were specifically evaluating the techniques that Charles River Endosafe was utilizing for bleeding horseshoe crabs. Walls' and Berkson's (2000) study was specifically evaluating the techniques used by BioWhittaker. "Each LAL producer has a unique operation in processing horseshoe crabs. They each have unique bleeding methods, method of capture, distance and method of travel to bleeding lab, holding time and conditions, and methods of return most appropriate to their own setting and situation. The results found in this study reflect those of BioWhittaker and may not be reflective of other companies' procedures" (Walls and Berkson 2000).

In 2000, a study was conducted by Aquacultural Research Corporation (ARC) on direct mortality of horseshoe crabs associated with the bleeding process at ACC. ARC monitored 100 total horseshoe crabs (50 bled and 50 unbled) for about 3 weeks. At the end of the monitoring period, 1 dead horseshoe crab was found from each treatment pen, but 16 total horseshoe crabs were unaccounted for (6 bled and 10 unbled). From this information, ARC concludes in a letter to ACC (included as Attachment 8 in ASMFC 2001) that " . . . it is safe to assume that the overall mortality resulting from this study was approximately 2% . . .would recommend that this study be replicated by a third party. As you are aware we, ARC, are perceived by many to be a vested interest and therefore any studies we perform are open to criticism due to that interest." ARC is one of three vendors who purchase horseshoe crabs from harvesters and supply them to ACC (ASMFC 2001). This study used small sample sizes, was conducted over a short period of time, did not release its methodology and resulted in a 16% loss of horseshoe crabs from the study pens.

Determining the effects of use given the lack of information on mortality of horseshoe crabs processed by ACC, is confounded by the fact that no studies to date have considered the long term impacts and effects of bleeding on spawning behavior, fecundity and long term survival of horseshoe crabs. Novitsky, president of ACC wrote (1984 [AR, 5A, 165-171]), "At ACC, LAL production is seasonal, beginning in the spring with the appearance of the horseshoe crabs ending their winter hibernation and returning to the Cape beaches to spawn . . . During this time, the horseshoe crabs can be easily collected in shallow waters, where mating pairs are found spawning. Fortunately for the horseshoe crab, an interruption of breeding does not have much effect on the reproductive cycle. Once returned to the water, the female crab will return to the beach, find another mate, and resume egg laying" (AR, 5A, 169). There are no scientific data that suggest

horseshoe crabs return to their regular biological and reproductive cycle after they are released (AR, Add.D, 128-148). Spawning behavior of horseshoe crabs following release could be critical to the long term health of the population. Since horseshoe crabs are collected in intertidal areas during spawning activity, or in subtidal areas on their way to spawning areas, and females are selected over males because of their size, it is reasonable to assume that some horseshoe crabs are collected before they have spawned. Following bleeding by ACC, horseshoe crabs "are either returned to the vendor who in turn notifies the harvester to pick up the crabs at their facility for return to the water or returned to the water by a dredge boat contracted by ACC." (ASMFC 2001) In addition, while aquarium studies suggest that a crab regains its blood volume in 3-7 days and amoebocytes regenerate in 3-4 months (Novitsky 1984 [AR, 5A, 165-171]), no studies have investigated how this regeneration affects the reproductive cycle of horseshoe crabs.

In conclusion, questions remain about the impact of the biomedical harvesting on the population of horseshoe crabs at Monomoy NWR. Given industry trends, it is likely that ACC's consumption of horseshoe crabs has increased over the past decade. No specific data relevant to ACC's methods of processing are available. ACC's competitors indicate that their mortality is about 10% following bleeding in the first year. There is currently no information collected by any LAL producer relevant to the effects of bleeding on reproduction, and the cumulative effects of potential decreased fecundity on the population over time. In addition, only 2 years of population data have been collected for Monomoy NWR and because horseshoe crabs do not reproduce until they are 9-10 years of age (Shuster Jr. 1982 [AR, 5A, 90-117]), declines in the population may not be realized until a decade after they have been over exploited. "Moreover, because of the advanced age of first breeding, damage to the horseshoe crab population would be expected to last years, perhaps decades" (Niles and Clark 1997-Draft [AR, 5A, 423]) making population recovery extremely difficult.

Shorebird Population Trends Worldwide: Shorebirds were historically reported to occur in "huge numbers", but hunting for sport and food during the late 1800s and early 1900s resulted in decreases in populations of many species of shorebirds. Although hunting has been illegal for all but two species of shorebirds since 1916 (Helmers 1992), many populations of shorebirds are still declining today. "Of the 49 shorebird species that migrate through North America, five have declined by 25% or more over the last five years, and 16 others have projected or actual population declines of 5% to 20% . . . Many of the negative shorebird population trends suggest habitat degradation (50% of U. S. wetlands have been lost or degraded), depletion of critical food supplies (over-harvest of Delaware horseshoe crabs may be the most recent example), or other factors at work" (B. Harrington 1999). The United States Shorebird Conservation Plan identifies a number of shorebird characteristics that pose "conservation challenges" including: 1) long distance migration; 2) low productivity and resulting slow population recovery; 3) concentration of populations and increased vulnerability to environmental occurrences; 4) dispersed and ephemeral habitat; 5) loss of habitat; 6) population changes and 7) the need to conserve across international borders (Brown et al. 2001).

Long distance migration, concentration of populations at migration sites and loss of habitat are all characteristics of shorebirds that make protection of migration sites critical to population survival.

Each year, shorebirds make two migrations to and from their breeding grounds, which generally occurs from March through May (to breeding grounds), and from July through October (from breeding grounds) (Helmers 1992). Migrations from wintering areas, which can be as far south as Tierra del Fuego, to breeding areas, which can be as far north as the Arctic Ocean (Brown et al. 2001) can be 12,000 kilometers (Helmers 1992). Helmers (1992) writes, "In most species, the adults leave breeding areas before juveniles have fledged. The staggered flights of adults and juveniles extend the migration period in the postbreeding season." During these migrations, shorebirds congregate at coastal and inland staging areas. "Shorebirds differ from many other Neotropical migrants (songbirds) in that they have narrow habitat requirements that limit them to relatively few, highly productive stopover sites. Shorebirds use the same coastal staging areas year after year, probably because the areas provide more highly productive, predictable feeding and roosting areas than other sites along the migratory route. Before departing, many shorebirds increase body mass up to 100 percent at these staging areas. Most of this increased mass is the fat required to fuel their long-distance migration. Because shorebirds have higher metabolic rates than other nonpasserines of similar size, they must spend much of their day, during staging periods, foraging for maintenance and fat storage" (Helmers 1992).

The United States Shorebird Conservation Plan notes the " . . . extraordinary degree to which some species depend upon one or a small number of strategic stopover sites; concentration makes them extraordinarily vulnerable to environmental disruption because much of the population is in the same place at the same time. Recognition of this special aspect of shorebird biology, and the need to devise novel conservation strategies, were the major factors driving the creation of the Western Hemisphere Shorebird Reserve Network" (Brown et al. 2001). Established in 1986, "WHSRN recognizes critical shorebird staging areas through a voluntary, non-regulatory designation program. Today, over 120 public and private agencies in seven countries throughout the Americas are part of the coalition. . . . WHSRN currently recognizes over 9 million acres at 34 designated sites, most hosting hundreds of thousands to millions of shorebirds annually" (B. Harrington 1999).

The loss of habitat that has been traditionally used by shorebirds has hampered recovery efforts. Shorebirds rely on migratory stop-over sites which offer an abundant, and often ephemeral, food supply. The occurrence of large numbers of shorebirds in just a few sites during migration, makes many species of shorebirds extremely vulnerable to habitat changes, or changes in food supply. In addition, shorebirds' low reproductive success means that populations will take a long time to recover (Brown et al. 2001). "Although most shorebirds nest in the Arctic or subarctic where disturbance is low, they can have low reproductive success nonetheless. Because climatic conditions here are highly variable, the breeding season is short and many raise only one brood" (Helmers 1992). While migratory stop-over sites are certainly important to breeding shorebirds heading towards nesting areas, they are also important to young of the year that are migrating south after hatching. "Increased availability of required habitats at summer and fall migratory stopover sites should increase survivorship of fledged young and therefore benefit total populations" (Helmers 1992).

Shorebird Population Trends in Massachusetts: There has been a decline of shorebird species

in Massachusetts over the years (Brian Harrington, Manomet Center for Conservation Sciences, Manomet, MA, pers. comm.). "Monomoy is one of the most spectacular migratory stopover areas in Massachusetts" (Veit and Petersen 1993). In general, the Northern Atlantic Region contains high concentrations of Black-bellied Plover, Red Knot, Sanderling, Semipalmated Sandpiper, Dunlin and Short-billed Dowitcher, all which occur in great numbers on Monomoy NWR (Veit and Petersen 1993, USFWS 2001). The North Atlantic Region is considered "extremely important to the species relative to the majority of other regions" (Brown et al. 2001). Monomoy NWR contributes to the importance of this region by offering habitat that has an abundant food supply and relatively low disturbance. It has been documented that disturbance to shorebirds during this critical time may prolong their stay at stop-over areas (Clark 1996 [AR, 5A, 344-346]). In 1999, Monomoy was designated a WHSRN site because of its value to migratory shorebirds as a stopover site. For many shorebirds, migration stopover sites are critical to success in accumulating enough fat reserves to complete their migration to breeding areas (Helmers 1992, Brown et al. 2001). "Other studies have shown that few shorebirds leaving New England staging sites at low weights are returning in later years, whereas those leaving at high weights are returning in much higher numbers" (Pfister et al. 1992). It is likely that the low-weight birds perish in their over-ocean flight to South America, but this has not been proven (B. Harrington, pers. comm.).

Shorebirds commonly seen at Monomoy include Black-bellied Plover, Semipalmated Plover, American Oystercatcher, Greater Yellowleg, Lesser Yellowleg, Willet, Whimbrel, Hudsonian Godwit, Ruddy Turnstone, Red Knot, Sanderling, Semipalmated Sandpiper, Least Sandpiper, Pectoral Sandpiper, Dunlin, and Short-billed Dowitcher. Some species occur in large numbers during both the spring and fall migrations such as Black-bellied Plover, Sanderling, Semipalmated Sandpiper, Ruddy Turnstone and Dunlin. In addition, shorebirds preparing for their journey across the Atlantic Ocean to South America on their southward migration, rely on Monomoy NWR (AR, 2B, 180-189). The largest concentrations of Red Knot, Semipalmated Plover, and Short-billed Dowitchers are observed during the southward migration on Monomoy NWR. (Veit and Petersen 1993, USFWS 2001). In fact, Monomoy NWR is one of the top ten sites for Short-billed Dowitchers, which are declining on the Atlantic Coast. Monomoy NWR is also very important to Hudsonian Godwits, which only use 2 or 3 sites on their southward migration. (AR, 2B, 183-184). "Monomoy Island is probably the most important traditional fall stopover area in North America for this transoceanic migrant . . . " (Veit and Petersen 1993).

Finally, some species of shorebirds are extremely dependent on Monomoy NWR during the breeding season, such as American Oystercatcher and Willet. The greatest concentration of nesting American Oystercatchers in Massachusetts occurs on Monomoy NWR and surrounding islands. In late summer, gatherings of adults and young of the year occur in greatest numbers on Monomoy NWR (Veit and Petersen 1993). American Oystercatchers are considered a "Species of High Concern" by the U. S. Shorebird Conservation Plan (Brown et al. 2001). Willets also occur in great numbers on Monomoy NWR during the breeding season (Koch 1999 and 2000) and are considered a "Species of Moderate Concern" by the U.S. Shorebird Conservation Plan (Brown et al. 2001).

Monomoy NWR was established because of its value to migratory birds. In addition, the

designation of Monomoy NWR as a WHSRN site and an IBA is a testament to its importance in offering valuable shorebird habitat in an landscape that is rapidly losing shoreline to development and human use. Monomoy NWR does not host the same numbers of shorebirds during the spring migration as Delaware Bay, but it is clearly a critical stopover site for thousands of shorebirds during both the spring and fall migrations. Monomoy NWR offers protected habitat for shorebirds to feed and roost in preparation for the next leg of their migration. Disturbance during these stop-overs, when shorebirds feed much of the time, can be extremely detrimental. In addition to providing vital food sources, Monomoy NWR offers habitat free of disturbance due to its seasonally closed areas. Monomoy NWR also provides critical nesting habitat to a variety of birds, including Federal-listed Roseate Terns and Piping Plovers.

Relationship Between Shorebirds and Horseshoe Crabs: The most extensive body of research examining the relationship between shorebirds and horseshoe crabs has been conducted in Delaware Bay which encompasses coastal New Jersey and Delaware. Delaware Bay became the first designated "Hemispheric Site" by WHSRN because of its importance to migratory shorebirds (Tsipoura and Burger 1999 [AR, Add.D, 207-212]. It has long been documented that shorebirds in Delaware Bay rely on horseshoe crab eggs during their migration to breeding grounds (Sperry 1940, Castro et al. 1989 [AR, 5A, 229-244], Castro and Myers 1993 [AR, 5A, 265-268], Botton et al. 1994 [AR, 5A, 276-282], Dutton 1998, Harrington and Shuster Jr. 1999 [AR, 5A, 587-592], Tsipoura and Burger 1999 [AR, Add.D, 207-212]). At least 20 species of shorebirds rely on horseshoe crab eggs to build up fat reserves during their migration to breeding grounds (Margraf and Maio 1998 [AR, 5A, 458-498]), and more than 10 species of shorebirds utilize horseshoe crab eggs in Delaware Bay (Myers 1986 as in Castro et. al. 1989 [AR, 5A, 229-244]) including: Red Knots, Short-billed Dowitchers, Sanderlings, Ruddy Turnstones, Dunlin, Least Sandpiper, Semipalmated Sandpiper, Pectoral Sandpiper and Semipalmated Plover (Sperry 1940, Recher and Recher 1969 [AR, 5A, 50-64], Shuster Jr. 1982 [AR, 5A, 90-117], Castro et. al. 1989 [AR, 5A, 229-244], Tsipoura and Burger 1999 [AR, Add.D, 207-212]). Species especially dependent on this resource are Red Knot, Sanderling, Semipalmated Sandpiper and Ruddy Turnstone. It appears that loss or impaired use of this resource would have major impacts to populations of these shorebird spp [species]" (AR, 2B, 188). "At the peak of this gathering, some 200,000 shorebirds may occupy a fifteen-mile stretch of shore, and 60,000 of them may be red knots" (Biderman 1983 [AR, 5A, 121]).

The reduction in spawning horseshoe crabs has caused up to a 70% decline in horseshoe crab eggs in Delaware Bay (Tsipoura and Burger 1999 [AR, Add.F, 207-212]). The decline in horseshoe crabs and subsequent decline in shorebirds is described by Niles and Clark (1997-Draft). "Preliminary observations of shorebirds and horseshoe crabs in 1997 suggest severe population damage to horseshoe crabs and a consequent negative impact to migratory shorebirds. The most recent count of shorebirds on the entire bay currently stands at just over 200,000 birds of all species, about 10% below average, while last year's count was the lowest total count ever recorded in 11 years of surveys. Shorebird numbers on the NJ shore have dropped to 37% of the bay-wide population, down from 51% in previous years. The shift in distribution is concentrated in red knots, where most of the population (88%) is in Delaware, along with sanderlings and ruddy turnstones. In previous years, most of the bay's sanderlings were observed in NJ, but in 1997

about half are in Delaware. Moreover, at least two of five red knots with radio transmitters attached in NJ moved to the Delaware shore. Visiting scientists Clive Minton and Alan Baker postulate that if anecdotal observations of horseshoe crabs and shorebirds movements are accurate, then a hemispheric collapse of shorebird reproduction may be likely" (Niles and Clark 1997-Draft [AR, 5A, 424]).

While discussion of the horseshoe crab-shorebird relationship has principally focused on Delaware Bay, documentation of shorebirds feeding on horseshoe crab eggs on Cape Cod dates back to 1881, when red-breasted sandpiper (Red Knot), and turnstones are referenced with respect to foraging on horseshoe crab eggs (Hadgood 1881). Forbush reported (1912) that, "Red-breasts [Red Knots] . . . are fond of the spawn of the horsefoot crab, which, often in company with the turnstone, they dig out of the sand, sometimes fighting the former birds before they can claim their share . . . ". A more recent study conducted in Plymouth, Massachusetts in 1976, confirmed that Short-billed Dowitchers were feeding on horseshoe crab eggs, and that the number of agonistic (combative) encounters among these birds were higher when foraging in areas containing horseshoe crab eggs. In addition, the number of Short-billed Dowitchers feeding at these sites declined as horseshoe crab eggs became less abundant later in the season (Mallory and Schneider 1979 [AR, 5A, 79-86]).

Many of the shorebird species that use Monomoy during migration (including Sanderling, Short-billed Dowitcher, Least Sandpiper, Semipalmated Sandpiper, Ruddy Turnstone, Red Knot, and Dunlin) have been documented feeding on horseshoe crab eggs in other areas, such as Delaware Bay. These species are present on Monomoy during horseshoe crab spawning periods, or soon enough after spawning that horseshoe crab eggs would be an available food item (Veit and Petersen 1993; USFWS 2001; S. Koch pers. comm; Sharon Fish Marino, Monomoy NWR, USFWS, Chatham, MA, pers. comm.). Further, many of these shorebird species are considered "Species of High Concern" by the United States Shorebird Conservation Plan (Brown et al. 2001) including: Ruddy Turnstone, Red Knot, Sanderling, Short-billed Dowitcher. Additional species considered "Species of Moderate Concern" which congregate at Monomoy include: Semipalmated Sandpiper, Least Sandpiper, Dunlin, and Black-bellied Plover (Brown et al. 2001).

In 2001, Refuge staff began a study specifically to determine if shorebirds are eating horseshoe crab eggs at Monomoy NWR. On June 4, 2001, one Semipalmated Sandpiper was taken on North Monomoy after it was observed (in an area where horseshoe crabs spawn) feeding with a flock of 100 sandpipers and about 10 Willets. The Semipalmated Sandpiper did contain horseshoe crab eggs in its digestive system. (unpubl. data from Monomoy NWR). In July, Refuge staff collected additional information about shorebirds feeding on horseshoe crab eggs by mistnetting shorebirds and flushing stomach contents for further analysis. In total, stomach contents from 44 Short-billed Dowitchers, 1 Willet, 3 Semipalmated Sandpipers, and 1 Semipalmated Sandpiper were collected, and the birds were then released. In total, 17 of the 49 gut samples collected contained horseshoe crab egg membranes. All samples containing membranes were collected from Short-billed Dowitchers (unpubl. data from Monomoy NWR). This new information on the actual feeding by shorebirds at Monomoy NWR confirms all reports collected elsewhere in Massachusetts and in mid-Atlantic locations.

In an attempt to gain additional information about the importance of horseshoe crab eggs to shorebirds on Monomoy NWR, blood samples were obtained from 35 Short-billed Dowitchers. Stable isotope analysis, which has been developed in Delaware Bay, was used to analyze the samples. The results of the isotope analysis indicate a major shift in foods consumed in more recent time, or likely since the birds left their Arctic breeding grounds, and a greater similarity in the birds' more recent diet at Monomoy NWR than the past diet over more widely scattered breeding areas. A more thorough interpretation, including degree of dependence on horseshoe crab eggs, cannot be made without knowledge of the isotope signatures of all potential foods available to the shorebirds while feeding on Monomoy NWR (Mike Haramis, Patuxent Wildlife Research Center, Laurel, MD, pers. comm.). More data will be collected in 2002.

Evidence of horseshoe crabs in the guts of shorebirds collected on Monomoy NWR confirms visual observations (documented by video camera) that horseshoe crab eggs are a prey item of shorebirds feeding there. This information corroborates documentation from the late 1800s of Red Knots and Ruddy Turnstones feeding on horseshoe crab eggs on Cape Cod, and documentation from the late 1970s of Short-billed Dowitchers feeding on horseshoe crab eggs in Plymouth, Massachusetts. This behavior is also consistent with shorebirds at other more southern stop-over sites on the Atlantic Flyway. While this most recent evidence of use of horseshoe crab eggs by shorebirds was collected during the fall shorebird migration, horseshoe crabs are abundant on Monomoy NWR during the spring migration as well, and it is likely that shorebirds using Monomoy NWR during the spring migration also utilize available horseshoe crab eggs.

Anticipated Impacts of the Use on Shorebirds: Harvesting for the biomedical industry and the commercial bait fishery both remove adult horseshoe crabs from the population. Since both uses target gravid females that are collected as they approach, or while on, spawning beaches, it is likely that these uses result in a decrease in the number of horseshoe crab eggs that are deposited on the beaches. In Delaware Bay, the reduction in spawning horseshoe crabs resulted in a 70% decline in horseshoe crab eggs (Tsipoura and Burger 1999 [AR, 5A, 419-437]) and this decline has been linked to subsequent declines in shorebirds on the New Jersey shores. (Niles and Clark 1997-Draft [AR, 5A, 419-437]).

A number of species of shorebirds rely on Monomoy NWR during the spring and fall migration for habitat for feeding and resting. We have confirmed that horseshoe crab eggs are one of the food items consumed by shorebirds at Monomoy NWR. While we have not identified all of the species that feed on horseshoe crab eggs on the Refuge, this information is consistent with numerous studies from Delaware Bay that document the importance of horseshoe crab eggs to shorebirds during the spring migration. Given that Monomoy NWR is a critical spawning site for horseshoe crabs (evidenced by past harvest totals and the fact that 25 percent of the total Massachusetts1999 harvest was landed from Monomoy NWR) and is a critical migratory stop-over site for shorebirds, it is likely that horseshoe crab eggs are an important food item in shorebirds' diets and a critical part of the food web on Monomoy NWR.

Available information from mid-Atlantic migratory stop-over sites indicates there have been significant declines in shorebird numbers, following the declines in spawning horseshoe crab

numbers, during a period when harvesting of horseshoe of crabs for bait and biomedical use has increased. Given the similar increase in harvesting pressure of horseshoe crabs in Massachusetts, the near extirpation of horseshoe crabs in other Massachusetts sites, and increased harvest interest on Monomoy NWR in particular, the Refuge is concerned about the incompatibility of this harvesting activity with staging and migratory shorebirds.

Over-harvesting horseshoe crabs on Monomoy NWR may result in a decline of available horseshoe crab eggs for migratory shorebirds. This degraded habitat could affect shorebird productivity, survival, and ultimately the total population. If shorebirds that rely on this site during the spring migration do not find the necessary food supplies it may result in lower body weights when they depart for their breeding area, which in turn would adversely impact survival and reproductive success. Similarly, if shorebird adults and juveniles that rely on Monomoy NWR during the fall migration do not find the necessary food supplies to finish migration to the wintering area, mortality may increase (Pfister et al. 1992).

Anticipated Impacts of the Use on Other Fauna and the Ecosystem in General: Horseshoe crabs and their eggs are utilized by a variety of other birds occurring on Monomoy NWR (USFWS 2001) including: Red-winged Blackbirds (*Agelaius phoeniceus*) (Reese 1973), Herring Gulls (*Larus argentatus*), Great Black-backed Gulls (*Larus marinus*) (Botton and Loveland 1993 [AR, 5A, 261-264]), and Laughing Gulls (*Larus atricilla*) (Shuster Jr. 1982 [AR, 5A, 90-117], Penn and Brockman 1994, Burger and Wagner 1995 as cited in Burger 1996). All of these species actually nest on Monomoy NWR. Numbers of nesting pairs of Laughing Gulls on Monomoy NWR has historically varied from a high of 1,000 pairs in 1981 to zero pairs in 1995 (USFWS 1996). Recent data however suggest an increasing trend as Laughing Gull pairs have increased from 19 pairs in 1999, to 376 pairs in 2000, and 805 pairs in 2001 (Koch 2000, unpubl. data from Monomoy NWR). In mid-Atlantic states, the diets of adult and young Laughing Gulls during the breeding season is largely comprised of horseshoe crab eggs (Burger 1996).

In addition, horseshoe crab eggs are often eaten by minnows and juveniles of larger fish. " . . . Given the chance, larger fish take entire egg masses" (B. Harrington and Shuster Jr. 1999 [AR, 5A, 590]). Eggs and larvae are documented food sources for a variety of fish occurring on or near Monomoy NWR (Mugford 1975, USFWS 1988, Nancy Finley, Cape Cod National Seashore, National Park Service, Wellfleet, MA pers. comm.) that in turn provide food for other nesting birds including: killifish (*Fundulus*) species (N. Finley pers. comm.), such as striped killifish (*Fundulus majalis*), eel species such as American eel (*Anguilla rostrata*), (Warwell 1897, deSylva et al. 1962), weakfish (*Cynoscion regalis*), northern kingfish (*Menticirrhus saxatilis*), Atlantic silverside (*Menidia menidia*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudopleuronectes americanus*) (deSylva et al 1962, Penn and Brockman 1994), striped bass (*Morone saxatilis*) (Martin 1974), and white perch (*Morone americanus*) (Shuster Jr. 1982 [AR, 5A, 90-117]).

Observations of other fauna feeding on horseshoe crab eggs, hatchlings and adults include: sand shrimp (*Crango septemspinosus*) (Price 1962), 8 mollusk species (*Mollusca*) (Perry 1940, as in Shuster Jr. 1982 [AR, 5A, 90-117]), fiddler crabs (*Uca* sp.)(Shuster Jr. 1958 as in Shuster Jr. 1982

[AR, 5A, 90-117]), blue crab (*Callinectes sapidus*), green crab (*Carcinides maenus*) spider crab (*Libinia sp.*) in Barnstable Harbor, Massachusetts (Shuster Jr. 1958 as in Shuster Jr. 1982 [AR, 5A, 90-117]). Devil ray (*Mobula hypstoma*), (Teale 1945 as cited in Shuster Jr. 1982 [AR, 5A, 90-117]), puffers (*Tetradontidae*) (Shuster Jr. 1958 as cited in Shuster Jr. 1982 [AR, 5A, 90-117]), sharks and loggerhead sea turtles (*Caretta caretta*) (ASMFC 1998b [AR, 4A, 164-231] and 1999a [AR, 4A, 250-319]). All of these species occur on or near Monomoy NWR.

Many species of birds nesting on Monomoy NWR feed heavily on fish during nesting and chick rearing. During this time, food availability is critical, and often influences chick survival. Monomoy NWR currently provides nesting habitat for federal-endangered Roseate Terns, and is one of only a few sites in Massachusetts where this species nests (unpubl. data from Massachusetts Division of Fisheries and Wildlife). During the past 4 years, the number of nesting pairs of Roseate Terns has varied from three to more than 40 (Koch 1999 and 2000, unpubl. data from Monomoy NWR). Roseate Terns in the North Atlantic generally nest in association with large productive Common Tern colonies (also present on Monomoy NWR) and numbers of nesting pairs often varies from year to year depending on food availability, weather, and predation (USFWS 1998b). Roseate Terns feed on a variety of fish, including Atlantic silversides (which eat horsehoe crab eggs and are present on Monomoy NWR (Gochfeld et al. 1998). During August and September, hundreds to thousands of Roseate and Common Terns congregate on Monomoy NWR and surrounding beaches before beginning their southward migration (Trull et al. 1999, Koch 2000, unpubl. data from Monomoy NWR.).

Monomoy NWR is also extremely important to nesting wading birds, including Snowy Egrets (*Egretta thula*) and Black-crowned Night-Herons (*Nycticorax nycticorax*). The number and quality of nesting sites for wading birds has slowly been declining over a long period of time in Massachusetts, largely due to human activities (Brad Blodget, Massachusetts Division of Fisheries and Wildlife, Westboro, MA, pers. comm.). Monomoy NWR currently hosts a heronry of 25-40 breeding pairs of Snowy Egrets (*Egretta thula*) and over 200 breeding pairs of Black-crowned Night-Herons (Koch 1999 and 2000; unpubl. data from Monomoy NWR.). Diet studies conducted in New Jersey and Carolina report that some of the major prey items of Snowy Egrets include Atlantic silversides and killifish (Kneib 1982 as cited in Parsons and Master 2000). Items that Black-crowned Night-Herons reportedly feed on include: eels (*Anguillidae*), killifishes (*Cyprindontidae*), flounder and puffers (Palmer1962 as cited in Davis 1993). These species of fish occur on or near Monomoy NWR and have all been documented feeding on horseshoe crabs and their eggs.

Sand shrimp, molluscs and crabs are also important food items to a variety of birds that utilize Monomoy NWR for breeding, feeding, and resting. Sand shrimp was found to be the most common invertebrate consumed by Semipalmated Sandpipers during the fall migration in coastal Massachusetts and consisted of more than half the diet by volume (Schneider and Harrington 1981 as cited in Gratto-Trevor 1992). Monomoy NWR is also an important nesting and staging site for American Oystercatchers and an important roosting site for Whimbrels. During the breeding season, more than 20 pairs of American Oystercatchers nest on the Refuge. In addition, the largest concentration of this species in Massachusetts occurs on Monomoy NWR or on the surrounding

beaches in late summer and early fall. In 2001, over 100 adults and young were counted (USFWS 1996; Koch 1999 and 2000; S. Fish Marino, pers. comm.). Numbers of Whimbrels can exceed 700 individual birds in one night during July (unpubl. data from Monomoy NWR). American Oystercatchers eat mostly shellfish and marine invertebrates including: bivalves, molluscs and worms (Heppleston 1972 as cited in Nol and Humphrey 1994) which may feed on horseshoe crab eggs. Whimbrels often eat sand shrimp on Cape Cod (Skeel and Mallory 1996). Both American Oystercatchers and Whimbrels also eat a variety of crabs (Skeel and Mallory 1996; Bent 1929, Tomkins 1947, Cadman 1979, Johnsgard 1981, Nol 1989 all as cited in Nol and Humphrey 1994) that may feed on horseshoe crab eggs. Both species are considered "Species of High Concern" by the United States Shorebird Conservation Plan (Brown et al. 2001).

Application of Wilderness Act: The Wilderness Act (P.L. 88-577) was enacted by the U.S. Congress in 1964 to establish a National Wilderness Preservation System. The Act charted a new course in history by preserving some of the country's last remaining wild places in order to protect their natural processes and values from development. Wilderness is defined by section 2(c) of the Act as land where the natural community of life is untrammeled by humans, who visit but do not remain. It is further defined as areas offering outstanding opportunities for solitude, primitive, or unconfined type of recreation. These areas may contain ecological, geological, or other features of scientific, educational, scenic, or historical values. Section 4 of the Wilderness Act authorizes uses of Wilderness Areas with the primary management goal of preserving wilderness character. Section 4(a) declares that the Wilderness Act shall be supplemental to the purposes for which refuges have been established. Except as specifically provided for in the Act, or minimum actions needed for administrative duties and emergency health and safety procedures, the Act prohibits commercial enterprises, landing of aircraft and other mechanical transport, permanent and temporary roads, motor vehicle use, motorized equipment or motor boat use, structures, and installations. Commercial services supporting recreational or wilderness purposes such as guiding services, ecological tours, outfitters, etc., are permissible.

Within the National Wildlife Refuge System, wilderness recreational uses must be compatible, wilderness dependent, non-motorized, and involve no mechanical transport. Commercial uses that are not recreational in nature are prohibited. Because harvesting of horseshoe crabs for use by the biomedical industry and/or sale as bait are both non-recreational commercial activities not supportive of wilderness purposes, these uses are already legally prohibited in Wilderness Areas on Monomoy NWR (See Attachment 1 for the Wilderness Area boundary). While the 1994 compatibility determination noted that "this low-profile harvest technique does not impact the wilderness character of the island", it never took into account the Wilderness Act's prohibition on commercial activities within a Wilderness Area. (AR, 1C, 492).

Conclusion: Compatibility determinations are based on procedural requirements and regulations and the sound professional judgement of the refuge manager. In determining whether a proposed use is compatible, the refuge manager must consider the mission of the NWRS and the purpose of the refuge. The National Wildlife Refuge System mission is to " . . administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of

present and future generations of Americans. . ." (see 16 U.S.C. § 668dd(a)(2)). Monomoy NWR was established for "...use as an inviolate sanctuary, or for other management purpose, for migratory birds." The purpose of the wilderness portions of Monomoy NWR is to "preserve the wilderness character of the Monomoy Islands" (Public Law 91-504, Designation of Wilderness Areas within National Wildlife Refuges). New regulations at 50 C.F.R. § 25.12 (a) define the following terms:

> "*Compatible use* means a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgement, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge."
>
> "*Conservation,* and *Management* mean to sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing, in accordance with applicable Federal and State laws, methods and procedures associated with modern scientific resource programs. Such methods and procedures include, consistent with the provisions of the National Wildlife Refuge System Administration Act of 1966 (16. U.S.C. § 668dd-668ee), protection, research, census, law enforcement, habitat management, propagation, live trapping and transplantation, and regulated taking."
>
> "*Fish*, *Wildlife*, and *Fish and Wildlife* mean any member of the animal kingdom in a wild, unconfined state, whether alive or dead, including a part, product, egg, or offspring of the member."
>
> "*Purpose(s) of the refuge* means the purpose(s) specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a national wildlife refuge, national wildlife refuge unit, or national wildlife refuge subunit. For refuges that encompass Congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the wilderness portion of the refuge."
>
> *"Sound professional judgement* means a finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), and other applicable laws. Included in this finding, determination, or decision is a refuge manager's field experience and knowledge of the particular refuge's resources."

Since 1994, when harvesting of horseshoe crabs for biomedical use and subsequent return to the waters was found compatible on Monomoy NWR, a change in the conditions under which the use

is permitted has occurred, and new information regarding the effects of the use has been generated. The Refuge Manager decided that the changes in conditions and new information was significant enough to potentially change the outcome of the compatibility determination (50 C.F.R. § 25.21 (f) Compatibility Policy § 2.11 H (4), 65 F.R. 62490).

Since 1994, more information is available relative to horseshoe crab population trends and harvest pressure, which indicates a change in conditions from 1994 about the connections between horseshoe crabs and migratory birds and other wildlife resources, and in the regulatory programs concerning management of horseshoe crabs and the National Wildlife Refuge System. A summary of the information that was not considered in the 1994 compatibility determination but has been considered here follows:

- Horseshoe crabs' reproductive cycle makes them vulnerable to over-exploitation. The reproductive strategy of congregating in large numbers on beaches to spawn makes them easy targets for any harvester both in the intertidal and subtidal areas close to spawning beaches. Because this species does not breed until 9-10 years of age, declines in populations may not be realized for many years, and populations will be slow to recover from over harvesting.

- Both bait and biomedical harvesters generally prefer female horseshoe crabs.

- Horseshoe crabs can be harvested by trawling in deeper waters. Shallow water harvesters (both bait and biomedical) focus their efforts on high tides when the horseshoe crabs are moving into shallow waters to breed. The gentle topography of the west side of Monomoy NWR (including North Monomoy Island and the north tip of South Monomoy Island) allows horseshoe crab harvesters to easily collect animals in the intertidal areas on spawning beaches, and in the subtidal areas, on their way to the spawning beaches. The reproductive strategy of horseshoe crabs and the topography of Monomoy NWR result in a situation where horseshoe crabs can easily be over harvested. Horseshoe crabs can be harvested in numerous other places in Massachusetts, as evidenced by State totals presented earlier. The State even notes that their own surveys " . . . show that the majority of spawning beaches are not harvested." (Diodati 2002). In addition, harvesters in other parts of Massachusetts currently use other methods to harvest horseshoe crabs, including trawling in deeper waters.

- There has been a significant change in the fishing effort and harvest of horseshoe crabs rangewide from the 1990-1994 levels which were about a million pounds per year to five million pounds in 1996. Fishing effort and horseshoe crab landings have declined in recent years. This is in part due to new regulations. Bait harvest yields for the 2001 Massachusetts harvest is less than the 1997-2000 levels, as a result of new regulations, daily trip limits, closed seasons and the availability of biomedical crabs for bait (Diodati 2002). There is still no information on what effects increasing harvest pressure during the 1990s has had on the spawning population.

- There is evidence that some populations of horseshoe crabs in the mid-Atlantic states have begun declining. While coast-wide trends can not be inferred, recent data indicate that local populations in Massachusetts are also declining. Populations in Bourne declined by 80% between 1984 and 1999 and were substantially decreased at Stage Harbor by 1999 over numbers five years before.

- Harvesting of horseshoe crabs for use by the biomedical industry has increased by 100-300% over 1989-1991 levels.

- Declines in other traditionally harvested fish, and an increase in demand for whelk and American eel have resulted in larger harvests of horseshoe crabs for commercial fisheries during the 1990's.

- The Refuge observed an increase in horseshoe crab harvesting activity in and near the Refuge in 1999. The State of Massachusetts reported that 25% of the harvest was obtained from the Refuge.

- In addition to observed declines in some horseshoe crab populations, data on shorebirds indicate significant declines for many species (Brown et al. 2001).

- Monomoy NWR hosts thousands of shorebirds every year during the spring and fall migration which utilize horseshoe crab eggs as a food resource.

- Monomoy NWR was designated as a Western Hemisphere Shorebird Reserve Network Site in 1999, in recognition of its importance to migratory shorebirds.

- At least two species of shorebirds have been documented feeding on horseshoe crab eggs during migratory stop-over on the Refuge. A decline in the horseshoe crab population would result in a decline in this shorebird prey item.

- Horseshoe crabs and their eggs have been documented to be prey items of a variety of other wildlife which in turn are prey items for a variety of migratory birds, including federal-listed Roseate Terns. A decline in the horseshoe crab population could result in a decline in the food supply for a variety of species.

- Coast-wide efforts to restrict harvest of horseshoe crabs has occurred through quotas imposed by ASMFC, which Massachusetts has adopted, and more restrictive limits or closures by other states. NMFS has also established a marine sanctuary.

- No regulatory agency has information to establish harvest quotas based upon biologically sustainable levels.

- The permits issued by USFWS for biomedical harvest in 1994 and successive years allowed commercial harvest in the shallower portions of the Wilderness Area closed to other users.

Non-enforcement in the balance of the Wilderness Area resulted in commercial bait harvesting occurring there. These uses were in violation of the Wilderness Act. Commercial harvesting in areas of the Refuge outside of the Wilderness Area was never legally authorized as no compatibility determination was issued for that use.

- In 1994, harvesting of horseshoe crabs for biomedical use was found compatible because it was determined, at that time, to be a non-consumptive use. However, this was based on a single study conducted in 1983, which concluded that there was a 10% mortality rate among bled horseshoe crabs. Since 1994, two additional studies (although not directly comparable to ACCs methods) have been conducted and found similar mortality rates associated with the bleeding process. A use that results in 10% mortality is a consumptive use; the conclusion in the 1994 compatibility determination was inaccurate. Impacts of disturbance during the reproductive migration are unknown. Female horseshoe crabs are intercepted before they reach the shallow beaches and breed. No studies have been conducted to determine whether females harvested for the biomedical industry reproduce during that given year or what long term effects on survival are. That compatibility determination indicated it would be re-evaluated when use by the biomedical industry increased, which has occurred.

- New regulations were adopted by the USFWS for the issuance of compatibility determinations.

We acknowledge that there are still gaps relative to effects of the use on the resource. More research needs to be conducted on: mortality associated with bleeding by ACC; long term effects of biomedical use on horseshoe crab reproduction and populations (how does bleeding affect gravid females); population trends on Monomoy NWR and in surrounding areas; dependence of shorebirds on horseshoe crab eggs on Monomoy NWR during spring and fall migrations; and importance of horseshoe crabs and their eggs to other wildlife.

Lack of knowledge in these areas, however, does not preclude the Refuge Manager from making a compatibility determination. The Compatibility Policy, § 2.12 A (8), published at 65 F.R. 62492, states that, "Refuge Managers are not required to independently generate data on which to base compatibility determinations." To the extent that we do not have long-term harvest information, the new compatibility policy requires that where information is insufficient to document compatibility, the use must be denied, as only uses with an affirmative finding of compatibility can be permitted. If information available "is insufficient to document that a proposed use is compatible, then the Refuge Manager would be unable to make an affirmative finding of compatibility and we must not authorize or permit the use." § 2.12 A (8)(a), 65 F.R. 62492 and § 2.11 E, 65 F.R. 62490. "If an application for a use is denied, it need not be shown that the use is not compatible" (see Final Rule, Supplementary Information Issues 7: Denying Uses, 65 F.R. 62468. Several comments made by the public were to the effect that no adverse effect from a particular activity (such as harvest for use by the biomedical industry) were proven, therefore the use should be allowed. However, the regulation requires the opposite conclusion. Until a particular activity can be shown to be compatible, it cannot be permitted.

The NWRSIA establishes that compatible wildlife-dependent recreational uses are priority uses for Refuges. All horseshoe crab harvesting ultimately results in a commercial use and therefore does not qualify as a priority refuge use. Pursuant to 50 C.F.R. § 29.1, economic uses of natural resources must be found to contribute to the Refuge mission and purposes. A consumptive use, whether 100% consumptive (bait harvesting) or partially consumptive (biomedical harvesting) of wildlife prey items is not consistent with the Refuge purposes or mission and would affect the Refuge's ability to meet its mandated purposes, and therefore is inconsistent with 50 C.F.R. § 25.21, §29.1, and § 26.41 (a)(10). The Service also received comments suggesting that the Refuge close its waters to harvesting for bait, but, for the recognized public health benefits from LAL, allow harvesting and use by the biomedical industry to continue. As a matter of sustained population management, this may be a step which the State of Massachusetts chooses to take at other spawning sites in Massachusetts. However, it is not appropriate to draw such distinctions within the Refuge. The connections between migratory birds, Refuge purposes, and horseshoe crabs apply regardless of the use to which the horseshoe crabs are put. The factors pointing to their decline, their slow reproductive cycle and lack of information about long-term populations levels apply as well as lack of information on long-tern mortality and effects on productivity. Biologically, no information (other than less than 100% mortality) distinguishes the harvesting of horseshoe crabs for bait from the harvesting of horseshoe crabs for the production of LAL. Permitting private consumptive uses of a wildlife food source in light of the lack of evidence that this resource is sufficiently abundant now (and will be in the future) to both support the commercial uses and still meet shorebirds' and other wildlife's needs is inconsistent with the National Wildlife Refuge System mission, and the purpose for which the Refuge was established.

Availability of Resources: This section requires the USFWS to provide an analysis of the costs for administering and managing each use. (50 C.F.R. 26.41 (7), 65 F.R. 62483). As this use has been found to be not compatible, no significant additional costs will be incurred for the management of this activity. Law enforcement patrols, currently occurring to protect horseshoe crabs, will continue utilizing Refuge Law Enforcement staff and USFWS Special Agents when necessary. We anticipate increased patrol efforts to ensure that harvesting is not being conducted in any portion of Monomoy NWR. The USFWS will continue to conduct status research and monitor horseshoe crab populations. These studies are ongoing and, if they result in a finding which would support an affirmative compatibility determination, the matter can be re-evaluated.

Public Review and Comments: A draft compatibility determination was released for public comment from February 1 to March 25, 2002. A public hearing was held on March 21, 2002. Comments were solicited via a newspaper advertisement and by directly mailing the compatibility determination to interested parties. This final compatibility determination reflects changes made in response to public comment. In addition, a new section (Appendix A) has been added to specifically respond to the issues raised by the public.

Justification: Harvesting of horseshoe crabs from Monomoy NWR for any use has been found incompatible. Information provided in this compatibility determination indicates that the proposed uses would not contribute to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission, but could, based on available information, contribute to

a decline of horseshoe crabs on Monomoy NWR. Because a decline in horseshoe crabs at Monomoy NWR could impact shorebirds and other species, allowing these uses could compromise biological integrity, diversity, and environmental health. Sound professional judgement of this information calls for a conservative, risk averse strategy and supports rejection of the prior compatibility determination related to harvesting for biomedical use, and justifies a closure to all harvesting Refuge wide.

Determination (check one below):

____X____ Use is Not Compatible

_____ Use is Compatible

Signature: **Refuge Manager:** 5-17-02
(Signature and Date)

Concurrence: **Regional Chief:** 5-23-02
(Signature and Date)

Mandatory 10- or 15-year Re-evaluation Date: **May 20, 2012**

Attachments:

1. Map of Monomoy NWR, September 15, 2000

2. Compatibility Determination-Nonconsumptive Harvest of Horseshoe Crabs, September 3, 1994

Appendix:

A. Issues Raised by the Public and Service Responses

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Exhibit N

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The Role of Horseshoe Crabs in the Biomedical Industry and Recent Trends Impacting Species Sustainability

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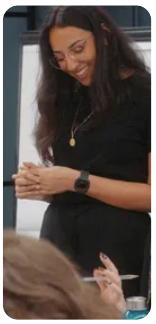
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Figures and Tables

Figure 1

Abstract

Every year the Atlantic horseshoe crab (*Limulus polyphemus*) arrives on shore to spawn, a sight once taken for granted. However, in addition to the gradual climate changes impacting all ecosystems, commercial demand from the widespread application of Atlantic horseshoe crab blood in industrial endotoxin testing and steady use as eel and whelk bait has brought the future of this enduring species into question. In response, regulations have been adopted to enhance the traceability and record keeping of horseshoe crab harvest, which has historically been difficult to track. However, these regulations do not restrict or limit LAL harvest in any significant manner. Still, sometimes-lethal biomedical bleeding process and associated behavioral changes pose a risk to horseshoe crab viability after bleeding and once returned to the waters. As a result, regulators and environmentalists are concerned that current trends and overfishing of this marine arthropod will significantly impact the surrounding ecosystem. This review examines their role and recent trends in the biomedical industry that are impacting these ancient creatures and the derivative effect on shorebirds, while considering emerging alternatives where feasible, as well as ways to ensure sustainable and pragmatic harvesting strategies. Ultimately, healthy populations of

Our research integrity and auditing teams lead the rigorous process that

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Introduction

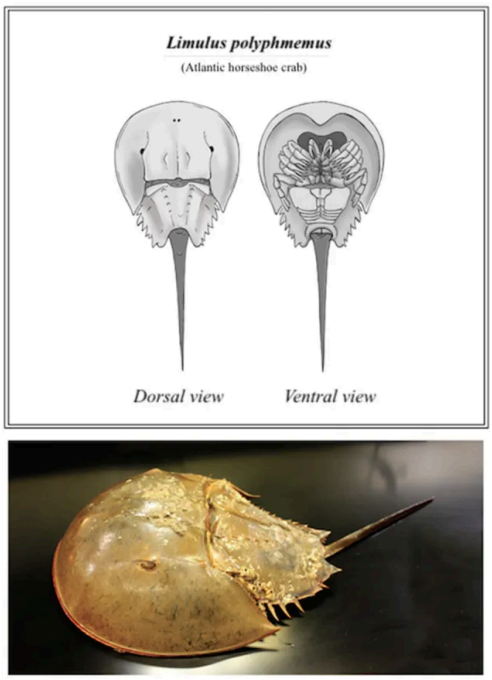
The American horseshoe crab (*Limulus polyphemus*) is a valuable keystone species distributed across the Atlantic Coast of the United States and the Gulf of Mexico (Botton and Haskin, **1984**; Botton and Ropes, **1989**; Walls et al., **2002**; Botton, **2009**; Sekiguchi and Shuster, **2009**). Horseshoe crabs play a key role in the eel and whelk fishing industry and an unparalleled, integral part in ensuring environmental safety and that of nearly every drug and medical device in use today (van Holde and Miller, **1995**; Loveland et al., **1996**).

This ancient aquatic arthropod, more closely related to scorpions and spiders than to crabs (Størmer, **1952**), belongs to its own distinct class, Merostomata (Woodward, **1866**), literally meaning "legs attached to mouth." The name "horseshoe crab" is derived from the *Limulus polyphemus'* most recognizable features, its extended prosoma (or *cephalothorax*), a large shell that resembles a horseshoe (Figure **1**). Commonly referred to as a "living fossil," the horseshoe crab has been able to survive nearly unchanged for an estimated 200 million years (Walls et al., **2002**; Kin and Blazejowski, **2014**)—prior to recent population dynamics in the face of growing commercial demand. Concerted conservation and research efforts are

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stake-holding organizations are examined further, as discussed herein.

Figure 1



Basic anatomy of the horseshoe crab (*L. polyphemus*) **(Top)**; and photograph of a mature female **(Bottom)**.

Factors affecting horseshoe crab populations

Interest in the horseshoe crab has grown over last half century due to the distinctive nature of its blood and popular publications articulating the

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system with no adaptive immune response, the horseshoe crab has survived through the ages by an "innate immunity" based on granular amebocytes, which comprise 99% of its hemocytes (Figure 2) (Shuster, 1978; Iwanaga et al., 1998; Medzhitov and Janeway, 2000). When these granular amebocytes come into contact with an endotoxin or 1,3ß-D-glucan (present in the cell walls of Gram-negative bacteria and fungi, respectively), a cascade of defense molecules is released, triggering coagulation and neutralization of the pathogens. The resulting clot effectively immobilizes the threat and prevents an infection from progressing beyond the wound (Isakova and Armstrong, 2003). While most recent research on horseshoe crabs has been focused on amebocytes and endotoxin detection (http://www.ncbi.nlm.nih.gov/pubmed/), some earlier studies have also yielded insights into human eyesight adaptation, the effect of circadian rhythms on vision, and the process by which sensory information is encoded (Hartline and McDonald, 1947; Barlow et al., 1977).

Figure 2

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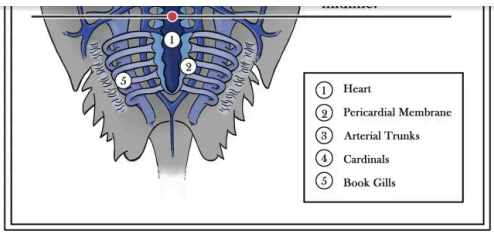


Diagram of horseshoe crab circulatory system (Diagram modified from Patten, **1912**; copyright permission, reuse or modifications of Figure **2** are not required for this image as it is in the Public Domain and holds no copyright).

The unique ability of amebocytes to produce an instantaneous, visible reaction to endotoxins, in particular, has driven commercial demand from pharmaceutical and biomedical companies to confirm drug and medical device safety (Mikkelsen, **1988**; Novitsky, **2009**) using the *Limulus* amebocyte lysate (LAL) test, which has become the method of choice for endotoxin detection (Novitsky, **2009**; Gauvry, **2015**). These LAL test applications include quality assurance for: intravenous drugs; biologicals (e.g., clotting factors, insulin, and vaccines); recombinant drugs; and implantable medical devices (e.g., heart valves and orthopedic devices) (Novitsky, **2009**). Environmental applications have also increased demand for the LAL test to ensure air quality and detect endotoxin concentrations in fresh water, sea water, and surrounding sediment (Novitsky, **2009**).

to concentrate the amebocytes. Water is then added to the packed amebocytes, causing them to lyse and release coagulation proteins; thus, the "lysate" nomenclature.

Historically, horseshoe crabs have also been used apart from the extraction of blood for safety testing. They were once harvested for fertilizer and livestock feed; but this widespread practice ended in the 1920s, as the stock of horseshoe crabs began to decline and the public nuisance of the strong odor hastened the adoption of more competitive, alternative fertilizers (Walls et al., **2002**). Thereafter, the use of horseshoe crabs as bait in commercial fishing became popular in the 1990s. Horseshoe crabs, particularly egg-bearing female crabs, proved to be an excellent bait for use in eel and whelk pots (Loveland et al., **1996**). However, as the increasing biomedical industry requirements of horseshoe crab blood and the species link to migratory shorebirds viability were realized, new oversight agencies were established to mediate the risks from over-harvesting, and restrictions were placed on the number of horseshoe crabs collected for bait in order to regulate populations. These agencies further generated programs for stock management, developed state quota regulations, and established best practices for biomedical harvesting. In 2015, 583,208 horseshoe crabs were harvested as bait for eel and whelk (Atlantic States Marine Fisheries Commission, **2016**), a significant

Impact of amebocyte harvesting on horseshoe crab behavior and physiology

The Atlantic States Marine Fisheries Commission (ASMFC) reported that in 2015, 559,903 horseshoe crabs were transported to biomedical facilities for the production of LAL (Atlantic States Marine Fisheries Commission, **2016**). The raw materials for the preferred LAL test require careful extraction of blood from horseshoe crabs. Established methods entail introduction of a hypodermic needle placed directly into the exposed pericardial membrane of the horseshoe crab to draw from 50 to 400 mL of blood, depending on the sex and maturity of the horseshoe crab (Figure **2**). The plasma is centrifuged, and LPS-free reagents, such as Na_2EDTA or 3% NaCl, are added to help prevent clotting after extraction; this can occur as a result of the unintended introduction of endotoxins or other external factors, including undue stress during extraction and exposure to extreme temperatures. Careful handling of the horseshoe crab during bleeding, while maintaining the crab and blood at low and consistent temperatures, can help to prevent such coagulation issues (Armstrong and Conrad, **2008**).

The harvest and collection procedure for bleeding horseshoe crabs may appear straightforward, but there are

harvesting range from 10 to 30%, however, these figures do not account for any further trauma and/or detrimental behavioral changes once the animals are returned to the ocean, nor the derivative population impact from the disruption of horseshoe crab spawning (Walls and Berkson, **2003**; Anderson et al., **2013**).

In fact, blood loss may not be the leading cause of death, but rather compounding factors, such as capture, handling and transportation. Biomedical harvest usually entails horseshoe crab collection from the bottom of the shallow seabed with dragging trawls and stacked on the bed of a boat before transferring them into plastic storage containers or bins for extended periods of time. During this process, crabs are crushed under the weight of other stacked crabs resulting in broken telsons and cracked shells, or accidentally impaled by the telsons of neighboring crabs. Each of these parameters must be evaluated when assessing overall mortality, rather than limiting the assessment to estimations. Prolonged survey and evaluation of recently bled horseshoe crabs could also provide more reliable extrapolation of morbidity if extended beyond the established 6-week assessment period.

A study evaluating these factors recorded no such sequelae in horseshoe crabs that were removed from the water only for the bleeding process and immediately returned, without being exposed to the impact

when conventional horseshoe crab capture, transport, storage and handling procedures at biomedical bleeding facilities were simulated, the time spent out of the water and extent of exposure to elevated temperatures appeared to play a role in increased mortality. In controlled laboratory simulations, crabs exposed to capture, transport and holding stressors without bleeding, compared to those exposed to both bleeding and other external influences, yielded 2.6 vs. 8.3% mortality rates; while crabs losing the greatest percentage of blood along with capture, transport and storage exhibited the highest mortality rates overall. When both groups of crabs had 40% of their blood volume extracted, only 6% of non-stressed crabs perished vs. 15.4% of stressed crabs. (Hurton and Berkson, **2006**). Thus, improved harvest practices have the potential to reduce mortality rates during biomedical harvest by more than half.

The stress from removing horseshoe crabs from the water during harvest may prove especially lethal. The horseshoe crab breathes through a set of gills and transports oxygen via hemocyanin (Towle and Henry, **2003**). The primary function of the gills is to supply oxygen, not to remove CO_2. Because carbon dioxide is water-soluble, it is easily removed when the animal is in an aquatic environment. However, when a crab is removed from the water, it is not able to efficiently remove CO_2, and regulation of PCO_2 results in abnormal hemolymph pH

in heart rate and increased affinity of oxygen to hemocyanin (Towle and Henry, **2003**); after removal from the water for only 5 min, they can develop severe hypoxia and metabolic acidosis. After 24 h of transportation out of water, horseshoe crabs have been shown to exhibit significantly diminished PO_2 levels and extreme respiratory acidosis (Allender et al., **2010**).

A review on the effects of hypoxic conditions on multiple marine organisms demonstrated that survival times are reduced by an average of 74% when an animal experiences hypoxia (Vaquer-Sunyer and Duarte, **2011**). Accordingly, hypoxia has been associated with decreased stamina in hermit crabs (Mowles et al., **2009**) and with altered fish migration patterns and distance (Ultsch, **1989**). Assuming similar side effects are likely in horseshoe crabs, oxygen deprivation and the resultant disturbance in homeostasis has the potential to disrupt normal functions, such as spawning, even after the horseshoe crabs are returned to their natural habitat.

Exposing horseshoe crabs to high temperatures during capture and/or transportation has also been shown to negatively impact both blood quality and overall health (Coates et al., **2012**). In a study to determine horseshoe crab response to varying temperatures, crabs held in the highest temperature (23°C) lost the most body weight and were among the only ones to expire.

During the study, horseshoe crabs held in 18°C water yielded a 43.9% decrease in hemocyanin concentration, while those held in 23°C water showed a 69.3% decrease (Coates et al., **2012**). Although the density of amebocytes decreased across all temperatures studied, the greatest decrease also occurred at the highest temperatures, with those held at 23°C yielding a decrease of 71.7%; which was also accompanied by notable morphological changes in the amebocytes.

Other, more nuanced behavioral changes brought about by the bleeding process have also been documented. Behavioral changes in horseshoe crabs have been observed for up to 2 weeks after harvesting (Anderson et al., **2013**). The horseshoe crabs showed: slower walking; a 33–66% reduction in overall activity; and decreased expression of tidal rhythms, which dictate movement and spawning activity. Harvesting, in particular, may reduce spawning activity of females; which is especially problematic, since horseshoe crab harvest often takes place while spawning, when the crabs are easily accessible on the beach (Leschen and Correia, **2010**). Upon habitat reintroduction, females have demonstrated markedly lethargic behavior and failed to spawn entirely (Anderson et al., **2013**). This negative impact on the horseshoe crab population is further compounded by the high mortality rate of 30% following the bleeding of female horseshoe crabs regardless of pre- or

mortality rate of horseshoe crabs harvested for solely biomedical purposes was 15%. However, when the number of crabs harvested, bled, sold by biomedical companies for bait, and counted against state bait quotas was factored in, the mortality rate jumped to 26% (Atlantic States Marine Fisheries Commission, **2013**).

While research organizations continue to investigate the industry practices and associated effects of the horseshoe crab biomedical bleeding process, such studies have been largely dismissed or regarded as not following industry established Best Management Practices (BMP) in 2011 (Atlantic States Marine Fisheries Commission, **2014**). Furthermore, some regulatory agencies have also asserted that such efforts would only be scientifically valid if all protocols were independently reviewed and approved by an advisory panel (Atlantic States Marine Fisheries Commission, **2010a**). Notably, the current elected panel is predominantly comprised of stakeholders representing the agencies that control horseshoe crab biomedical assay commerce (Atlantic States Marine Fisheries Commission, **2013**), suggesting that effective management strategies may be compromised by conflicting economic and environmental considerations.

Commission reports on horseshoe crab harvest mortality date back to 2004. From 2004 to 2012, the number of crabs delivered to biomedical bleeding facilities increased from 343,126 to 611,827, or by about 78%; while total mortality correspondingly increased by 75% (Atlantic States Marine Fisheries Commission, **2013**). The percentage of horseshoe crabs that died prior to being bled more than doubled from 2008 to 2012 (Atlantic States Marine Fisheries Commission, **2013**), which may be attributed to deleterious harvest and transportation practices. The maximum harvest mortality limit of 57,500 set by the ASMFC (based on the 15% mortality allowance) has been exceeded at times by more than 20,000 horseshoe crabs every year since 2007 (Atlantic States Marine Fisheries Commission, **1998**, **2013**). More recently, ASMFC data has estimated the mortality of horseshoe crabs harvested for the biomedical industry to be 70,000 (with a range of 23,000–140,000; Atlantic States Marine Fisheries Commission, **2016**).

The cumulative effects of horseshoe crab harvest have also been well documented. An especially compelling example has been observed near Cape Cod at Mashnee Dike, where the spawning horseshoe crab count dwindled from around 3,000 to 148, representing a 95.3% decline over a 15-year period (1984–1999). Mashnee Dike was brought under the protection of the United States Army Corps of Engineers, and no external development in that area has been

primary cause of this collapse. Albeit not as severe, a Long Island-based study monitoring 68 sites showed horseshoe crab populations decreased just over 10%, or roughly one percent per year from 2003 to 2014 (Tanacredi and Portilla, **2015**).

Reports from Delaware Bay and a few additional sites have cited modest horseshoe crab recoveries, but such examples have been the exception and seem to have been more than offset by shifting commercial activity to other geographic regions (Smith et al., **2009**). Stricter horseshoe crab regulations around the Delaware Bay/New Jersey coastlines have led to increased harvesting in New England, where continued population declines were noted in a 2009 survey (Atlantic States Marine Fisheries Commission, **2013**). As a result, regional management plans require coordination to ensure that horseshoe crabs are protected throughout their purview (Berkson et al., **2009**).

The increased demands of the U.S. population, which is growing by 2.6 million people each year, and rapidly growing medical device and vaccine industries (Gauvry, **2015**; Central Intelligence Agency, **2016**) may not bode well for horseshoe crab populations. Based on current rates of horseshoe crab mortality and related population trends, over the next two decades, demand for the LAL test is likely to reach unsustainable levels. While horseshoe crab populations have moderately stabilized in some regions

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well as deteriorating coastlines.

Global endotoxin detection is also dependent upon the TAL (*Tachypleus* amebocyte lysate) test produced in China, which is derived from the amebocytes of *Tachypleus tridentatus* and *Tachypleus giga*, Asian horseshoe crab species. Because these horseshoe crabs are often secondarily sold for human consumption or for the production of chitin after biomedical bleeding, resulting in a 100% mortality rate, population decline of these two species is a serious concern (Gauvry, **2015**). While specific survey data are not available as in the U.S., decreased harvest quantities suggest an 83% drop in abundance (Gauvry, **2015**). Unless China begins to regulate the harvest of *T. tridentatus* and *T. giga*, declining availability of the TAL test would be expected to increase demand for the LAL test throughout Asia (Gauvry, **2015**).

Environmental considerations

Sustaining the horseshoe crab population is also ecologically essential, as they play key roles as: bioturbators; hosts to a variety of epibionts on their shells; controllers of the population of many benthic invertebrates; and as a food source for a multitude of marine animals (Figure **3**) (Botton and Haskin, **1984**; Botton and Ropes, **1989**; Walls et al., **2002**;

consume a broad, omnivorous diet, adult horseshoe crabs are important predators of benthic invertebrates, such as bivalves, polychaetes, crustaceans and gastropods, with a particular preference for thin-shelled bivalves, like small surf clams and blue mussels (Botton and Haskin, **1984**; Botton and Ropes, **1989**).

Figure 3

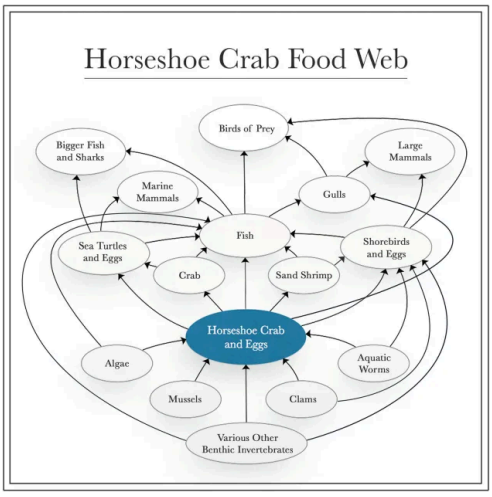


Diagram of feeding interactions of the horseshoe crab. Directions of arrows indicate impacts of each group on others through feeding interactions.

Shorebirds (e.g., red knots and ruddy turnstones), sand shrimp and fish (e.g., American eel, Atlantic silverside, catfish, devil ray, mullet, northern kingfish, silver perch, summer flounder, striped bass, swordfish, weakfish, white perch and winter flounder) consume

pufferfish eat juvenile horseshoe crabs (Walls et al., 2002; Botton, 2009).

Mature horseshoe crabs are not significantly threatened by natural predators due to their large size and thick shell, but some have been identified (Walls and Berkson, 2003). For example, large American alligators have been observed eating adult horseshoe crabs in the Indian River Lagoon in Florida on several occasions, and leopard sharks have occasionally consumed them, as well (Reid and Bonde, 1990; Walls et al., 2002). Whenever adult horseshoe crabs are upturned and stranded on the beach, herring and black-backed gulls typically eat them, removing the gills and legs in order to access eggs and internal organs (Botton and Loveland, 1993; Walls et al., 2002). However, loggerhead turtles (listed as threatened by the U.S. Endangered Species Act) are the most common predator of mature horseshoe crabs, which have comprised a significant portion of these turtles' stomach contents when found in the lower Chesapeake Bay (Keinath, 2003).

That said, in the mid-1980s the diet of loggerhead turtles in Virginia was dominated by horseshoe crabs, before transitioning to blue crabs in the 1980s, and more recently to finfish (Seney and Musick, 2007). These shifts are believed to have been caused by the decline in horseshoe and blue crab populations. The drop in these two populations may also correlate to the overall decrease in the number of sea turtles in the

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Chesapeake Bay (Spotila et al., 2007), indicating the possibility that loggerheads in this area also feed on horseshoe crabs (Botton, 2009). While few such observations have been published to conclude whether many other species of sea turtles also consume horseshoe crabs, one of the most endangered, Kemp's Ridley turtles, have been observed eating them (Servis et al., 2015).

Shorebirds as bellwethers

The spawning of horseshoe crabs in the Delaware Bay occurs between May and June, with 70% occurring during the first two spring tides in May (Smith and Michels, 2006). The migration of many shorebirds, such as the red knot (*Calidris canutus*), semipalmated sandpiper (*Calidris pusilla*), ruddy turnstone (*Arenaria interpres*), and sanderling (*Calidris alba*), correspond to horseshoe crab spawning (Clark et al., 1993). The rufa subspecies of the red knot (*Calidris canutus rufa*), for example, is a shorebird with one of the longest migrations in the animal kingdom, traveling up to 19,000 miles from its wintering regions in the southeastern U.S., northeastern Gulf of Mexico, northern Brazil, or the southern tip of South America to its breeding ground in the Canadian Arctic (U.S. Fish and Wildlife Service, 2015).

survive the final stretch of their journey to the frigid, unpredictable Canadian or Arctic tundra, which is often barren of further sustenance when they arrive (Baker et al., **2004**; Mizrahi and Peters, **2009**). Once in the Delaware Bay, red knots and other shorebirds feed predominantly on the eggs laid by spawning horseshoe crabs while they are available (Tsipoura and Burger, **1999**; Mizrahi and Peters, **2009**; McGowan et al., **2011**; Smith et al., **2013**). It is unlikely that other food sources found at shorebird stopover sites would be as widely available or as nutritionally dense as horseshoe crab eggs (Mizrahi and Peters, **2009**).

Specifically, the high fatty acid content of these eggs makes them the ideal food source for migrating shorebirds that need to rapidly gain weight in order to ensure robust fitness, and consequently survival, on their journeys (Mizrahi and Peters, **2009**). Survival and successful reproduction of the many migratory shorebirds that stop to feed at Delaware Bay are strongly linked to horseshoe crab reproduction. It is unlikely that these birds would be able to adjust their migration schedule over time (Baker et al., **2004**; Mizrahi and Peters, **2009**). From 1980 to 2014, red knot populations decreased by as much as 75% in some areas, largely due to the lack of horseshoe crab eggs in Delaware Bay (U.S. Fish and Wildlife Service, **2014**).

Stable isotope tracking to analyze the diets of shorebirds revealed that free-

estimated 107 billion horseshoe crab eggs are necessary to support 423,000 shorebirds flying into Delaware Bay to feed before continuing on to their breeding grounds (U.S. Fish and Wildlife Service Shorebird Technical Committee, **2003**). For example, when preparing for migration, sanderlings consume an average of 8,300 horseshoe crab eggs per day; ruddy turnstones, a daily average of 13,300 (with a peak daily consumption of 19,360 eggs); and red knots consume an average of 18,350 (with a peak consumption of 23,940 eggs/day) (Castro et al., **1989**; Haramis et al., **2007**).

Ensuring a consistent and sustainable supply of horseshoe crab eggs is of particular concern with respect to the red knot, which has been listed as a threatened species and may be one of most studied proxies for tracking horseshoe crab populations and viability (U.S. Fish and Wildlife Service, **2014**). The current red knot population is estimated to require 15.4 billion eggs to obtain sufficient energy levels for migration, which is equal to the number of eggs laid by about 170,000 female horseshoe crabs (U.S. Fish and Wildlife Service Shorebird Technical Committee, **2003**). To be healthy enough to complete their migration, red knots need to double their body mass (usually arriving at 90–120 g and departing at 180–220 g) before the entire flock departs Delaware Bay at month's end (Baker et al., **2004**). In total, 1,890 kilojoules (kJ) of stored energy is necessary to successfully

decreased by 70%, possibly due to late arrival in the Delaware Bay, compounded by a shortage of horseshoe crab eggs. Average body mass upon departure showed significant decline from 1997 to 2002, going from 182.8 grams (±22.6 g) to 162.3 g (±24.5 g) (Baker et al., **2004**). During these same 5 years, tagged survivors that made the journey back to Delaware Bay and were recaptured at least once were heavier than birds not seen again. Between May 2000 and May 2001, the number of returning red knots decreased by 47% (Baker et al., **2004**). The trends in declining body mass and population of red knots in Delaware Bay have correlated to an increase in the harvest of horseshoe crabs. Beginning in 1990 and peaking in 1998, horseshoe crabs were used largely as bait for eel and whelk fisheries, further impacting the availability of eggs for shorebird consumption (Walls et al., **2002**).

The size of the population of red knots in Tierra del Fuego, Argentina, also rapidly declined from 51,000 in 2000 to 27,000 in 2002 (Morrison et al., **2004**). In January 2003, an aerial survey of red knot sites along the Patagonian coast known to be abundant in the 1980s, located only 560 red knots. Likewise, a survey in December 2003 of northern Brazil indicated an abnormally small population of birds, suggesting evidence of red knot mortality, rather than just redistribution (Baker et al., **2004**).

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impediment to horseshoe crab population growth (Sweka et al., **2007**), shorebird predation on horseshoe crab eggs has not been found to reduce the size of the horseshoe crab population. Eggs brought to the surface by wave action (Nordstrom et al., **2006**) or other spawning horseshoe crabs (Sweka et al., **2007**) dry out and die if not consumed (Botton, **2009**). In fact, the eggs most accessible to the birds in the upper 5 cm of the beach comprise about 10% or less of the total density of buried eggs (Smith, **2007**; Botton, **2009**).

Further, red knots and other shorebirds have long been of interest to recreational birdwatchers, and efforts in recent years have been made to ensure that their foraging goes undisturbed. A combination of specified viewing locations and enforcement of policies, such as keeping unleashed dogs from roaming the beaches, have greatly reduced interruptions of these pivotal refueling stops during their migration (Burger et al., **2004**).

Conservation efforts

Regulatory efforts are underway to address dwindling horseshoe crab numbers. The Horseshoe Crab Management Board of the ASMFC approved the Horseshoe Crab Fishery Management Plan (FMP) in October

and bait harvesting in other areas, offsetting the prospects for overall horseshoe crab population growth (Atlantic States Marine Fisheries Commission, **2013**). Later addenda to the Horseshoe Crab FMP specified annual state-by-state landing quotas across the east coast and contributed to the establishment of the Carl N. Schuster Jr. Horseshoe Crab Reserve, a 1,500 square mile harvest-free zone (Atlantic States Marine Fisheries Commission, **2000**). Historically, the most comprehensive data on horseshoe crab abundance has been based on the Benthic Trawl Survey conducted by Virginia Polytechnic Institute (VPI), but the survey faces inconsistent funding circumstances. Other studies including the Delaware Trawl Survey, the New Jersey Delaware Bay Trawl Survey, and the New Jersey Ocean Trawl Survey have been established and helped intermittent funding limitations (Smith et al., **2016**). Funding for future years of the studies is undergoing evaluation.

Addendum IV of the FMP delayed harvest in Maryland and Virginia and restricted bait harvest in Delaware and New Jersey to 100,000 male-only crabs. It was approved in May 2006; and the addendum was extended through October 2013 (Atlantic States Marine Fisheries Commission, **2006**) with the addition of seasonal harvest restrictions on all horseshoe crabs from January to June and on female horseshoe crabs from June to December in Delaware and New Jersey

horseshoe crabs when implementing regulations, was established by Addendum VII in 2012. The ARM framework uses models considering red knot stopovers in Delaware Bay to determine optimal horseshoe crab harvest; has shaped several initiatives that aid in the protection of both species; and is the basis for ongoing assessments to optimize management plans (Atlantic States Marine Fisheries Commission, **2012**).

As a result of these efforts, the aggregate harvest of horseshoe crabs declined 70% from 1998 to 2006, with the greatest reductions occurring in Delaware Bay states (Smith et al., **2009**). The focus for conservation has also gradually shifted specifically to the spawning locations of the horseshoe crabs. As most crabs bury their eggs approximately 15 cm from the surface and above the high tide line toward the shore (Weber and Carter, **2009**), protection of coastlines in which the horseshoe crabs spawn has been vital in working to restore their numbers to previous levels (Berkson et al., **2009**).

Actions have also been taken in the fishing industry to reduce harvesting of horseshoe crabs for use as bait. These include alternative baits (Ferrari and Targett, **2003**; Fisher and Fisher, **2006**; Atlantic States Marine Fisheries Commission, **2015**) and using bait bags with improved efficiency that require as little as one-tenth of traditional quantities per bag (Atlantic States Marine Fisheries Commission, **2017**).

Furthermore, in 2015, conservation groups listed the red knot as endangered in the U.S., which would result in increased protection for horseshoe crabs. Conversely, members of the fishing industry have also challenged quotas due to an apparent continuation in the decline of the red knot population, despite a 2-year ban on horseshoe crab harvest in 2006 and 2007 (Moore, **2008**).

Commercial considerations

Given mixed results from these conservation efforts and impact from unabated LAL testing demands and utilization as a bait in the fishing industry, more sustainable approaches to horseshoe crab management and harvesting practices are urgently needed for medical and environmental applications.

Before adoption of the LAL test, most research facilities, pharmaceutical and medical device companies used the United States Pharmacopeia (USP) rabbit pyrogen test to determine the presence of endotoxins (Pharmacopeial Forum, **1983**). However, the method took significantly longer to obtain results, notwithstanding the inherent variability and ethical issues with the use of live rabbits. The World Health Organization (WHO) now recognizes several bacterial endotoxin test (BET) methods

amebocyte lysate clotting upon exposure to endotoxins or β-glucans (World Health Organization, **2011**). Notably, β-glucans can also be selectively "ignored" by removing the G factor responsible for the β-glucans clotting reaction.

To date, the LAL test has been the test of choice, despite a more recently uncertain supply of horseshoe crab blood. Fortunately, it has been possible to increase the hemolymph extraction volume from *L. polyphemus*, as more accurate techniques for measuring blood volume have been discovered. It was initially estimated that the blood volume of a horseshoe crab was 10% of its total body weight; however, more recent findings have shown that blood volume is actually closer to 25% of the animal's total weight (Hurton et al., **2005**).

New endotoxin tests have been developed and may have the potential to replace or supplement the LAL test; and thus, reduce or eliminate the demand for wild horseshoe crab capture. The recombinant factor C (rFC) test, for example, uses a cloned rFC reagent extracted from the DNA of the Singapore horseshoe crab and thereby eliminates the need for repetitive bleeding (Ding et al., **1995**). Like the LAL test, the rFC test triggers a pathway to coagulation when endotoxins come into contact with Factor C. The rFC molecule has multiple potential endotoxin binding sites, and as such, the rFC assay has been shown to be more sensitive and

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Questions and Answers, released by the FDA in 2012 (U. S. Department of Health and Human Services, **2012**), which also stipulates that manufacturers must provide method validation in compliance with requirements outlined in by United States Pharmacopeia (USP) section on Bacterial Endotoxin Testing (USP, Chapter 85).

Another "alternative assay" to the LAL test is the Monocyte Activation Test (MAT) (U. S. Department of Health and Human Services, **2012**), the MAT uses the monocytes of humans to mimic febrile reactions and thus requires no horseshoe crab byproducts, in contrast to the LAL and rFC assays (Stang et al., **2014**). The MAT has been used reliably to resolve discrepancies between LAL test results; however, it has been shown to be ineffective in the presence of cytotoxic agents (Dobrovolskaia et al., **2014**; Stang et al., **2014**). The standard MAT procedure also lacks the sensitivity to detect the required amount of pyrogens on medical surfaces (which is also a limitation of the LAL assay). While the MAT has been optimized to detect such pyrogens, including the ability to ensure sensitivity by incubating test materials in the MAT, the modified version can take up to 20 h and is therefore too time-consuming for practical application in most settings (Stang et al., **2014**).

Although the rFC and MAT methods produce results comparable to the LAL test (Alwis and Milton, **2006**; Thorne et

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extremely challenging. The industry has been reluctant to transition to newer methods due to the complex validation procedure and subsequent redesign of the manufacturing processes that would necessarily accompany the change to procedures that have been established and followed for approximately 40 years (Cohen, **1979**; U. S. Department of Health and Human Services, **2012**).

In fact, revising the current system to improve efficiencies in horseshoe crab use may be more viable in the near term. Rather than adopting alternative tests, some biomedical companies have opted to make existing tests more sustainable. For example, LAL assays with specially designed cartridges have been developed to reliably screen for endotoxins, while also using one-twentieth of the raw horseshoe crab material required by conventional LAL tests (Wainwright, **2013**).

Another alternative would be the use of a line of amebocytes that could be cultured *in vitro*. Research in this arena has yielded promising but inconsistent results (Joshi et al., **2002**; Hurton et al., **2005**); whereas, mounting pressures on the harvest of horseshoe crabs may yet help justify continued efforts and investment into this approach.

Alternatives to current horseshoe crab harvesting

populations. An instructive 56-day study of horseshoe crabs in captivity revealed decreases in body weight and deteriorating health, as reflected in various biological markers, including hemocyanin and amebocyte concentrations, which declined significantly (Coates et al., **2012**). Although these changes occurred at all temperatures over time, horseshoe crabs held in higher temperatures (23°C) experienced the most significant decreases in these key metrics. To achieve the lowest horseshoe crab mortality and highest blood quality during biomedical bleeding, a more systematic understanding of the nuances of the optimal horseshoe crab environment, feeding and care would be required to pursue this alternative. Alternatively, if horseshoe crabs were allowed to reach maturity in the wild and transferred to native and protected estuary habitats with periodic monitoring, the species vitality could be improved and a better chance of survival might be achieved, as well as facilitate more controlled bleeding operations and schedules.

Notwithstanding the deleterious effects of wild capture and transport, the mechanism of blood harvest via a needle puncture to the arthrodial membrane could also cause unintended damage to the horseshoe crab circulatory system. No studies to date have systematically examined the effects of the puncture wound itself; however, anatomy of the area whereby the cardiac rhythm is controlled by

protocols could assess the potential for using indwelling catheters or alternative extraction sites.

Within this same paradigm, additional research focused on the optimization of bleeding volume and intervals could assess the potential to decrease horseshoe crab mortality and increase amebocyte yield. If bleeding horseshoe crabs in a controlled protocol (e.g., a temperature-controlled environment with the immediate return to their habitat) might correspond to human benefits from blood donation (Salonen et al., **1998**), horseshoe crabs could potentially be bled more frequently with less trauma, while removing a smaller volume of blood per drawing. Also analogous to human plasmapheresis, the crab blood could be separated from the amebocytes and reinfused, or be replaced with a blood volume expander; this could alleviate hypovolemia while reducing stress and should allow for more rapid recovery.

Another important improvement to the bleeding process would be to minimize or prevent horseshoe crab hypoxia caused by extended periods outside the water. This could be accomplished by transporting the crabs in compatible tanks; employing wet covers, or towels, etc. (Novitsky, **2015**). Less stressful transportation might also be achieved with temperature-controlled containers and/or by locating bleeding facilities closer to the harvest sites.

Further, using a formula to estimate the total hemolymph volume could help

horseshoe crab bleeding would also help mitigate any resulting behavioral changes; foster future spawning; and help stabilize egg production for migrating bird sustenance. Establishing optimal female to male bleeding ratios to manage commercial pressures associated with a greater yield from females would also help ensure necessary breeding ratios toward the species' long-term viability.

Improving the survival rate of horseshoe crab larvae into adulthood would likewise contribute toward replenishing the horseshoe crab population. With a characteristically high mortality rate the early stages of life for numerous marine species, approximately 0.001% of crabs survive through the first year (Carmichael et al., **2003**; Sweka et al., **2007**). Researchers have had some success from collecting horseshoe crab eggs, rearing them in a laboratory, and releasing the crabs as juveniles. However, this approach has not been conducted on a large scale, and any objections to egg collection that might interfere with shorebird feeding would need to be addressed before advancing this notion to a broader initiative (Mishra, **2009**; Schreibman and Zarnoch, **2009**).

Finally, various steps could be employed to reduce fishing industry demands on wild horseshoe crab populations, such as alternative and/or synthetic baits for whelk and eel, which could be used in lieu of horseshoe crabs. Such alternatives utilizing

have outnumbered biomedical counts in recent years (Atlantic States Marine Fisheries Commission, **2016**), a reduction in bait harvest is vital for conservation of horseshoe crab populations. Yet, because biomedical harvesting does not typically result in immediate mortality, the full impact might be underestimated and unaccounted for once fatigued, traumatized, and sometimes dying horseshoe crabs are returned to their habitat. Given these factors, both bait and biomedical demands appear to pose unsustainable challenges to horseshoe crab populations. However, in the absence of a widely accepted alternative to the LAL test, and as it remains vital to global medicine, there are promising approaches that could be employed to lessen the impact and reduce the ultimate mortality from biomedical harvesting.

Conclusions

The unique characteristics of horseshoe crabs underpinning their irrefutable importance to medicine, environmental safety, and their role as a keystone species highlight an urgent and compelling need for conservation and sustainable practices. To date, horseshoe crab conservation has been largely unidimensional, with many of the regulations applying only to the commercial fishing industry (Berkson,

regulation, responsible and more innovative harvesting and bleeding practices; and a commitment to continued research in pursuit of viable alternatives to avert collapse, while working toward ultimately eliminating the demand for harvesting wild horseshoe crabs, entirely.

Moving forward, effective horseshoe crab management must also extend beyond traditional approaches (e.g., stock abundance, recruitment, and growth rates) and begin to incorporate interventional ecosystem strategies. New and improved operational protocols should be established scientifically and implemented universally. In October 2011, early steps were taken to establish a blueprint for Best Management Practices for the collection, bleeding and releasing of horseshoe crabs (Atlantic States Marine Fisheries Commission, **2011**, **2013**). The document was generated by the Horseshoe Crab Biomedical *ad hoc* Working Group and was comprised of experts from each of the key biomedical bleeding organizations. The early draft of the document showed promise, but it has yet to be updated based on further research, nor has it progressed beyond recommendations to enforcement. The ability to assess the value of a document has also been undermined by unpublished industry reporting, whereby horseshoe crab mortality is neither reported publicly nor tabulated empirically: it is merely assumed that 15% of the harvested crabs perish (Atlantic States Marine Fisheries Commisson, **2009**).

least 30% over the next three generations (~40 years) (Smith et al., 2016). In sharp contrast, the global demand for vaccines, pharmaceuticals and medical devices over approximately the same period will require an increasing supply of LAL. These dynamics pose significant uncertainties as to whether current harvesting levels can be sustained, much less meet projected demands. With particularly rapid development in vaccine production, global pharmaceutical and the U.S. medical device markets have already been trending toward 6–8% and 25% annual growth, respectively.

In addition to these projections, these challenges intensify if the Asian species continues to decline at its current rate (Gauvry, 2015). Utilized for analogous testing by Asian and Pacific-based pharmaceutical and medical device manufacturers in TAL assays, a shortfall in Asian horseshoe crabs could lead to a spike in the global demand for LAL or force adoption of costly, alternative testing methods. Dependent on these two species of horseshoe crabs that appear to be facing significant decline, the growth in vaccine production is especially problematic; whereby, a large percentage of endotoxin detection is also performed using TAL for vaccines destined for emerging markets (Gauvry, 2015). Despite recent, isolated recoveries, the IUCN forecast nonetheless suggests that the U.S. indigenous horseshoe crab biomass could not withstand the growth of the

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Regulators are faced with the paradox of managing a species to protect and maintain dependent shorebird populations; facilitate multibillion dollar eel, whelk and conch fisheries; and support the growing global dependence on an essential medical safety resource (LAL). These drivers are both environmental and economic. Indeed, progress and effective management will only be achieved once Best Management Practices are universally adopted and implemented; as public reporting is instituted; and as empirical data are gathered and tracked over time to inform industry and environmental regulatory oversight so as to ensure the viability of this ancient and essential species.

Statements

Author contributions

AD, TB, JK-G, and WA conceived of the presented idea. JK-G, WA, KD, RT-K, TB, and MG developed the theory and performed primary research reviews. AD, KD, CK, and TB verified the materials and methods. TB encouraged AD, JK-G, KD, and WA to investigate the biomedical medial industry impact on horseshoe crabs. AD supervised the findings of this work. All authors prepared analysis of the primary research and contributed to the final review manuscript.

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Conflict of interest

The authors have partnered with the Georgia Department of Natural Resources to support future scientific and management initiatives in effort that ensure that the Georgia Atlantic horseshoe crab populations remain vibrant and healthy through potential husbandry and bleeding protocols. Authors AD, JK-G, TB, and LR are employed by company Kepley BioSystems, Inc. CK is a full-time professor at the Joint School of Nanoscience and Nanoengineering and works three summer months with the company Kepley BioSystems, Inc. WA was a NSF research undergraduate employed by company Kepley BioSystems Inc. MG was employed by ClienTell® Consulting, LLC. The other authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Abbreviations

^{15}N
Nitrogen-15

ARM

Bacterial Endotoxin Test

BMP
Best Management Practices

FMP
Fishery Management Plan

LAL
Limulus Amebocyte Lysate

LPS
Lipopolysaccharide

MAT
Monocyte Activation Test

PCO_2
Partial Pressure of Carbon Dioxide

PO_2
Partial Pressure of Oxygen

rFC
Recombinant Factor C

TAL
Tachypleus Amebocyte Lysate

USP
United States Pharmacopeia

WHO
World Health Organization.

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Exhibit O

The Commonwealth of Massachusetts
Division of Marine Fisheries
(617) 626-1520 | mass.gov/MarineFisheries

Maura T. Healey	Kimberly Driscoll	Rebecca L. Tepper	Thomas K. O'Shea	Daniel J. McKiernan
Governor	***Lt. Governor***	***Secretary***	***Commissioner***	***Director***

February 23, 2026

UDPATED: Notice of Public Hearing and Comment Period:

Commercial Summer Flounder, Black Sea Bass, and Scup Limits; Commercial Horseshoe Crab Quotas; Commercial Sea Scallop Dredge Gear; Recreational Bluefish Limits; and Permitting

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Under the provisions of G.L. c. 30A, and pursuant to the authorities found at G.L. c. 130, §§ 2, 17A, 21, 38B, and 80, the Division of Marine Fisheries (DMF) is taking public comment on a series of proposed regulatory amendments at 322 CMR 4.00, 6.00, and 7.00. The draft regulations outlined below affect the management of commercial fisheries for summer flounder, black sea bass, scup, horseshoe crab, and sea scallop; commercial fisheries permitting; and recreational bluefish limits. Full text of the regulations may be found on DMF's website along with additional background information.

Schedule for Public Comment Period and Hearing

DMF will accept written public comment through 11:59PM on Sunday, March 1, 2026. Please submit written comments by email to marine.fish@mass.gov to the attention of Director McKiernan. DMF will also host a virtual public hearing on Thursday, February 26, 2026 at 6PM. To attend this virtual public hearing, please register here.

Proposed Regulatory Amendments

1. Sea Scallop Dredge Width (322 CMR 4.13). To create uniform regulations across jurisdictions, DMF proposes to modify the state's maximum sea scallop dredge width from 10 feet to 10.5 feet to align with federal small-dredge requirements.

2. Recreational Bluefish Limits (322 CMR 6.19). In response to coastwide liberalizations to the recreational bluefish limits, DMF proposes to increase the daily bag limit from 3 fish to 5 fish for anglers fishing from shore or a private/rental vessel and from 5 fish to 7 fish for anglers fishing from a charter or party boat.

3. Commercial Summer Flounder Limits (322 CMR 6.22). In response to an increase in the state's commercial summer flounder quota for 2026 and 2027, DMF proposes to:
    a. Establish a quota-based trigger for the Period I (January 1–April 22) and Period II (April 23–December 31) quota allocations whereby Period I receives 30% of the annual quota when it exceeds 750,000 pounds and 15% of the annual quota when it does not. The Period II fishery receives the remainder plus any underage from Period I.

b. Establish a quota-based trigger for the Period I trip limit whereby the trip limit is 5,000 pounds for all authorized gears when the annual quota exceeds 750,000 pounds and 2,000 pounds when it does not.
c. Increase the Period II summertime (April 23–September 30) trip limit from 500 pounds to 600 pounds for net fishers and 325 pounds to 400 pounds for hook fishers.
d. Eliminate Saturday as a closed fishing day during the Period II summertime fishery thereby allowing commercial fishing seven days per week.
e. Modify the quota-based trigger for the Period II fall (October 1–December 31) trip limit whereby the trip limit is 3,500 pounds, rather than 5,000 pounds, if at least 10% of the annual quota remains on October 1.

4. Commercial Scup Limits (322 CMR 6.27). In response to recent fishery performance, DMF proposes to liberalize the commercial scup limits during June to:
    a. Increase the daily trip limit for directed hook and line and pot gear from 400 pounds to 800 pounds.
    b. Add Monday and Thursday as open fishing days thereby allowing commercial fishing Sunday through Thursday.

5. Commercial Black Sea Bass Limits (322 CMR 6.28). In response to an increase in the state's commercial black sea bass quota for 2026 and 2027, DMF proposes to:
    a. Amend the in-season date where closed fishing days are automatically eliminated for directed hook and line and pot gear from September 15 to September 1.
    b. Amend the in-season date where trip limits for directed hook and line and pot gear may be automatically increased based on quota availability from September 15 to September 1.
    c. Eliminate the April 1 – April 22 closure period for trawlers thereby allowing them to land an incidental catch of up to 100 pounds year-round or until the quota is taken.

6. Commercial Horseshoe Crab Quotas (322 CMR 6.34). In response to changing demand for horseshoe crabs, DMF proposes to:
    a. Reduce the annual horseshoe crab bait quota by 40,000 crabs thereby moving it from 140,000 crabs to 100,000 crabs.
    b. Reallocate these 40,000 crabs to the biomedical quota at a 1:2 ratio thereby increasing the annual biomedical quota from 200,000 crabs to 280,000 crabs.

7. Housekeeping Affecting Regulated Fishery Permit Endorsements (322 CMR 7.01). To reduce the complexity of the commercial fisheries permitting system, DMF proposes to:
    a. Eliminate the Sea Scallop Shucking Endorsement. Any vessel lawfully authorized to possess and land sea scallops will be allowed to land shucked product. A Shellfish Endorsement will remain necessary to land whole in-shell product from areas open to the harvest of shellfish shellstock.
    b. Eliminate the sub-endorsements to the Coastal Access Permit for Squid, Whiting, Sea Herring, and Northshore Mobile Gear. The activities authorized by these sub-endorsements will instead be covered by the Coastal Access Permit.

8. Modifications to Offshore and Coastal Lobster Permit Rules (322 CMR 7.03 and 7.06). In response to industry requests, DMF proposes to allow any existing Coastal Lobster Permit holder whose corresponding vessel holds a federal lobster trap permit to permanently

surrender their Coastal Lobster Permit to DMF in exchange for an Offshore Lobster Permit thus permanently converting their trap fishery authorization from dual state-federal to federal only.

Exhibit P

The Commonwealth of Massachusetts
Division of Marine Fisheries

(617) 626-1520 | www.mass.gov/marinefisheries

MAURA T. HEALEY, Governor | KIMBERLEY DRISCOLL, Lt. Governor | REBECCA L. TEPPER, Secretary | THOMAS O'SHEA, Commissioner | DANIEL J. MCKIERNAN, Director

MEMORANDUM

TO: Marine Fisheries Advisory Commission (MFAC)

FROM: Daniel J. McKiernan, Director

DATE: December 14, 2023

SUBJECT: **Proposal Affecting Horseshoe Crab Management—Spawning Closures and Trip Limit Adjustments**

Proposal

For potential implementation this upcoming spring, DMF intends to go to public hearing this winter with the following proposals affecting horseshoe crab management:

- Replace the existing lunar-based spawning closures with a prohibition on all retention of horseshoe crabs during the spring spawning season. The closure period would not extend longer than April 15 – June 7.
- Amend the commercial bait trip limits. This proposal is multifaceted. First, I am proposing to adjust the hand harvest trip limit of 400 crabs per 24-hour period beginning at 12PM (noon) so that the trip limit is reduced to 300 crabs and applies per calendar day. This will establish a uniform commercial trip limit for all commercial fishers with a regulated fishery limited entry permit endorsement for horseshoe crabs. DMF then intends to adopt two trip limit triggers to manage the available bait quota for various users. The first trip limit trigger will increase the trip limits to 400 crabs per calendar day if less than 50% of the annual quota is taken on August 1. The second trip limit trigger will automatically reduce the trip limit to 200 crabs if 80% of the annual quota is taken before September 15. DMF is not proposing to adjust the open entry trip limit for mobile gear fishers of 75 crabs, nor the biomedical trip limit of 1,000 crabs.
- Complement federal prohibitions on horseshoe crab harvest within the Monomoy National Wildlife Refuge and the Cape Cod National Seashore.

Status of the Stock

The Atlantic States Marine Fisheries Commission's (ASMFC) most recent stock assessment (2019) for horseshoe crabs indicates the northern region (RI-ME) stock improved from poor condition to neutral condition compared to the 1998 baseline. This improvement was driven largely by increases in DMF trawl survey indices. The next ASMFC Horseshoe Crab Stock Assessment is scheduled to be released in 2024. Additionally, the 2022 Green List Report from the International Union for Conservation of Nature (IUCN) has also noted improvement in the abundance of crabs in the northeast region, which includes Massachusetts. For the northeast region, the IUCN Green List Report states "there appears to be a balance between loss of habitat and continued harvest pressure vs conservation measures. Thus, horseshoe crab populations appear to be fairly stable."

Data trends in Massachusetts since the 2019 ASMFC stock assessment and IUCN report are mixed. North of Cape Cod, DMF's spring and fall trawl surveys (Figure 1) were at or near time series highs in the late 2010's, but in more recent years declined to near time series median levels. All 2023 trawl survey data points north of Cape Cod were below their respective time series medians. South of Cape Cod, the DMF fall trawl survey is near time series median levels; however, the spring survey is still showing positive trends and remains above time series medians (Figure 2). The proportion of tows containing horseshoe crab is still generally showing positive signs in the Gulf of Maine in recent years, despite poor catch in 2023 (Figure 3). South of Cape Cod, the percentage of survey tows containing crabs remains above time series median for the spring survey but has declined in the fall survey (Figure 4). While most sites surveyed in the Massachusetts Spawning Beach Survey were below their time series medians in 2023, more than 70% of surveyed beaches show increasing trends over the last five and ten-year periods (Table 1).

The bait fishery for horseshoe crabs principally occurs south and west of Cape Cod with Nantucket Sound being the primary harvest area. In 2022, 85% of Massachusetts horseshoe crabs harvested for bait came from Nantucket Sound, with lesser amounts harvested from Cape Cod Bay (7%), Vineyard Sound (5.7%), Buzzards Bay (1.4%) (Figure 5), and less than 1% coming from all other areas combined. The biomedical fishery is similarly focused south and west of Cape Cod. However, Pleasant Bay—along the Outer Cape—has been an important site for the collection of biomedical crabs for nearly 50 years and has been closed to bait harvest since 2006.

Public Interest in a Spawning Closure

In January 2023, the Horseshoe Crab Conservation Association petitioned DMF to enact an annual horseshoe crab harvest closure through June 15 to protect spawning horseshoe crabs (Attachment 1). DMF considered this petition and proposed draft regulations to adopt a spawning closure through May 31. After reviewing public comment, DMF recommended the MFAC approve an April 21 – May 31 spawning closure. Ultimately, this recommendation was not approved by the MFAC due to prevailing concerns regarding the negative economic impact it may have on hand-harvesters, bait supply, and biomedical firms' business practices. Moreover, some MFAC members expressed skepticism about the lack of scientific evidence suggesting the horseshoe crab resource was declining and thus necessitating a management action.

The general public, including many in the conservation community, remain strongly committed to the enhanced conservation of the horseshoe crab resource. Specifically, they have argued that harvest should be substantially limited given the cultural and ecological value of horseshoe crabs. Some have expressed opinions that the horseshoe crab resource is depleted compared to historic levels and recent improvements in abundance trends are insufficient to support population recovery. Further, some insist the current management scheme serves only to maintain existing population levels sufficient for commercial harvest and does not address the ecological services provided by horseshoe crabs and horseshoe crab eggs[1].

These positions are evidenced in the public comment received during this past winter's rule making process and more recently in a letter from Massachusetts Audubon to the Department of Fish and Game (Attachment 2). Audubon's letter advocated[2] that the Department—and its Divisions—pursue horseshoe

[1] While it is difficult to quantify the benefits of horseshoe crab egg production on forage, shorebird advocates have long made arguments that spawning closures are necessary to increase the horseshoe crab eggs available on beaches to shorebirds. Similar forage arguments are now being extended to other species (e.g., sea turtles).

[2] Specifically, Massachusetts Audubon argued the Commonwealth should: (1) adopt a January 1 – June 30 spawning closure; (2) phase out all bait harvest; (3) improve performance standards and monitoring for the biomedical industry to reduce mortality and sub-lethal impacts; (4) increase interagency coordination to monitor the population status of horseshoe crabs in the context of their relationship to other species (e.g., shore birds); and (5) consider coastal resiliency in the context of climate change when developing strategies to restore horseshoe crab populations and other species (e.g., shorebirds).

crab population recovery initiatives as part of the Governor's Executive Order No. 618 on Biodiversity and Conservation in Massachusetts.

Rationale for a Spawning Closure

DMF has a long-standing history of constraining state-managed commercial fisheries from targeting known aggregations of spawning fish and has generally supported similar efforts at the federal and interstate level. As a general rule, it is advisable—and typically embraced by stakeholders—to provide animals protection from harvest during spawning events. This is particularly true for horseshoe crabs given they are exceptionally vulnerable to harvest during the spawning season because of their shallow subtidal staging behavior and easy access while on the spawning beaches. This is why DMF adopted the springtime lunar-based horseshoe crab harvest closures in 2010 and it is why I want to expand spawning horseshoe crab protections now.

Over the past decade, our survey data generally indicate improving population trends, but some recent data points are reverting towards time series medians. Additionally, we primarily observe animals that are three-to-four years away from maturity and older in our trawl survey, while only mature adults are observed in the spawning beach survey. At present, there is not a viable survey method available to us that can accurately enumerate young-of-the-year nor forecast future recruitment. Absent such an early warning system, DMF can only respond to trends observed in the adult or sub-adult segment of population. Moreover, horseshoe crabs are negatively impacted by the degradation of coastal beaches and consequent loss of spawning habitat. These conditions may accelerate in the coming decades given anticipated sea level rise and resulting erosion and shoreline armoring. For these reasons, I think it appropriate to manage this fishery with precaution and work to bolster the reproductive success of the current and future spawning stock biomass.

DMF's spawning beach survey data (2015-2022) show that both north and south of Cape Cod horseshoe crab spawning activity typically begins in May and concludes by mid-to-late June (Figure 6 and Figure 7). These data demonstrate that the proposal will protect approximately 90% of spawning females by delaying the annual bait and biomedical harvest through June 7th. Having the spawning closure begin to apply in mid-April also enhances spawning protections. First, it protects horseshoe crabs from harvest as they stage in nearshore areas immediately prior to the spawning event. This is particularly important in the context of the primary harvest area—Nantucket Sound—as the nearshore mobile gear closures do not go into effect until May 1[3] (Figure 8). Additionally, a mid-April closure would mitigate potential interannual variability in the timing of spawning, particularly should the spawning event begin earlier in the year (e.g., due to a warmer than usual spring).

This proposed action would also bring us in line with what is occurring in some other states. Massachusetts is one of four states—along with Rhode Island, Maryland, and Virginia—that currently have bait and biomedical fisheries. Each of these states provide spawning horseshoe crabs with more protections than they are currently afforded in Massachusetts. Rhode Island prohibits bait harvest in May and has lunar closures in May for its biomedical fishery; Maryland has a complex myriad of rules that prohibits directed bait fishing during the spawning season, prohibits the year round harvest of females for bait, and limits the biomedical harvest of females during the spawning season; and Virginia prohibits bait harvest within 1,000 feet of shore from May 1 – June 7 and bans the harvest of females in waters east of the COLREGS line (i.e., ocean zone). As for the rest of the northeast, Connecticut recently prohibited hand harvest in its bait fishery and does not have a biomedical fishery; New York features lunar closures

[3] 322 CMR 4.06(2) annually closes those waters within a boundary that approximates the three nautical mile line from Eastham to Mashpee from May 1 – October 31 to mobile gear except surf clam and ocean quahog dredges and dredges used in municipal managed shellfish fisheries.

in May and June affecting its bait fishery and does not have a biomedical fishery; and New Jersey does not have a bait fishery and prohibits harvest in its biomedical fishery until June 1.

This proposal is not without negative impacts. If adopted, it will disproportionately impact hand-harvesters who capture horseshoe crabs as they stage in shallow waters and come up on the beaches to spawn. Nearly all annual hand harvest has historically occurred between the last week of April and the first week of June (Table 2). Over the past three years we have had roughly 50 active hand harvesters with about 30 individuals participating in the fishery in any given year. While there may be some continued opportunity for hand harvest after the first week of June[4], I suspect effort and landings will be limited during this period because harvesters will likely pursue other work due to the loss of the peak season and because crab availability is more limited.

The loss of the springtime hand harvest fishery will also likely impact the bait supply for the spring channeled whelk ("conch") pot fishery, particularly in the first year of implementation. These impacts may be particularly acute in 2024 given the performance of the horseshoe crab fishery in 2023. In most years, it is common for bait dealers to have a surplus of horseshoe crabs at the end of the fall season that can be stored and made available to supplement bait demand when the conch pot fishery re-opens in the spring. However, it is my understanding that this is generally not the case at present. The early season (August 6) quota closure in 2023 of the horseshoe crab bait fishery limited the local bait available to the fall conch pot fishery requiring dealers to import additional bait from other states to meet demand. However, the economics of the conch pot fishery[5], coupled with the cost of bait, may have had a limiting impact on the volume of bait crabs being imported. Undoubtedly, the changing market conditions for channeled whelk complicate our understanding of impacts relative to the bait market and increases uncertainty moving forward. That said, I do suspect there may be a horseshoe crab bait shortage to start the spring conch pot season in 2024 regardless of my spawning closure proposal. Also, there are alternative—but purportedly less favorable—baits available to conch pot fishers[6] and they may be forced to switch over to those alternatives. Note that should poor market conditions persist for whelk there may also be much reduced conch pot fishing effort and subsequent demand for bait.

To address both the displacement of hand harvesters and potential bait shortages, I am interested in enhancing green crab fishing opportunities. Green crabs are an invasive species commonly found throughout nearshore marine habitats in Massachusetts, particularly our estuaries, saltmarshes, and mudflats. While industry feedback generally suggests horseshoe crabs are the most effective whelk bait, green crabs are also commonly used to supplement bait demand. It is worth exploring the potential for green crabs to become a more substantial part of the bait mix to offset the impacts of horseshoe crab conservation and to create market-based incentives to fish down this invasive species. To wit, I am interested in creating a more robust fishery for green crabs and will work with staff to streamline permit conditions and permit availability for commercial green crab trapping. Funding to outfit displaced horseshoe crab hand harvesters with green crab trap gear would be a creative legislative solution to help mitigate the impacts of these proposals.

Prior public comment would also suggest the biomedical industry may be concerned that spawning closures will limit their access to horseshoe crabs for Limulus Amebocyte Lysate ("LAL") production by seasonally eliminating the biomedical harvest of horseshoe crabs, as well as crabs available through the

[4] Based on our spawning beach survey data, some low level of spawning activity continues throughout June and post-spawning crabs may remain in shallow embayments where they are accessible by hand.
[5] Conch dealers informed DMF staff that the ex-vessel value of channeled whelk was depressed coastwide this fall. This is reportedly a product of economic conditions affecting the Chinese live market. SAFIS dealer data for Massachusetts shows ex-vessel value was about $3 per pound in November and early-December of this year, which is about 25% less than the average ex-vessel value in 2021 and 2022.
[6] These alternative baits include green crabs, molluscan shellfish, fish or fish racks, and other fish waste from processors.

rent-a-crab program. Given the critical importance of LAL production to global public health and safety, I am willing to consider potentially exempting some biomedical harvest from the proposed spawning closure to ensure Massachusetts' biomedical firms can obtain locally sourced horseshoe crabs to create this lifesaving product. Such an exemption—if adopted—would likely include certain conditions, such as a total cap on harvest during the spawning season (e.g., a capped percentage of the biomedical quota) and limitations on where harvest can occur (e.g., no harvest near spawning beaches or in nearshore areas where crabs may be staging to spawn). In the end, it would be my preferred outcome that the harvesters, dealers, and biomedical processors all amend their business plans to work around the spawning closure without such an exemption that could weaken the closure's enforceability and overall compliance.

Rationale for Bait Fishery Trip Limit Adjustment

The first aspect of this proposal is to adopt a uniform bait fishery trip limit of 300 horseshoe crabs per day for all limited entry permit endorsement holders. This will eliminate the higher trip limit of 400 crabs which applies per 24-hour period beginning at 12PM (noon) and enables fishers to fish two tides in a single calendar day. I perceive this as having several benefits. I anticipate this will reduce the potential harvest at the tail end of the spawning season once the proposed spawning closure has ended. In doing so, the potential for front loading the bait quota to meet rent-a-crab demand will also be reduced. This may help uniformly distribute bait landings across the year, with the intention of ensuring that supply and demand are well-linked in time. Lastly, a single trip limit for all bait permit holders would improve enforcement and compliance.

The second aspect of my proposal is to establish two triggers to automatically adjust trip limits at a certain date based on quota usage. For instance, should more than 50% of the quota remain available on August 1, I propose increasing the trip limit to at least 400 crabs per calendar day. This will allow mobile gear fishers to better access available quota later in the season to meet bait demand for the fall conch pot fishery and supplement biomedical demand through the rent-a-crab program. Additionally, I propose a trigger be adopted so that if 80% of the annual quota is taken before September 15, the trip limit is automatically reduced to no more than 200 crabs per calendar day. This may help the fishery postpone or avoid a quota closure. In turn, this would maintain a steady supply of bait to the market; reduce regulatory discarding in mobile gear fisheries—particularly the clam dredge fishery—that may occur into the late fall and early winter; and serve as a signal to biomedical firms to rely more on other sources of crabs (e.g., biomedical quota) to meet their annual production needs.

Rationale for Complementing Federal Harvest Closures

Federal rules affecting both the Cape Cod National Seashore and the Monomoy National Wildlife Refuge prohibit the harvest of horseshoe crabs within the park and refuge boundaries (Figure 9 and Figure 10). I intend to adopt complementary closures as part of DMF's horseshoe crab management regulations to enhance enforcement and compliance by allowing the Massachusetts Environmental Police to enforce harvest ban in specific geographic areas.

Additional Discussion

Performance of the 2023 Fishery

This year, the bait fishery closed on August 6 with 99.8% of the quota being taken[7]. This is only the second time ever that the annual bait quota was achieved, and the fishery was closed. In 2019, the fishery closed on August 31, about three-and-a-half weeks later than this year's closure. This year's early closure restricted the ability for mobile gear fishers to retain and land horseshoe crabs throughout the end of the summer and fall. This likely had a negative economic impact on our state waters mixed trawl fishery in

[7] To prevent an even earlier closure, DMF and the MFAC made an in-season adjustment on July 10 to reduce the bait crab trip limit for mobile gear fishers from 300 crabs to 200 crabs for limited entry endorsement holders and form 75 crabs to 50 crabs for open access fishers.

Nantucket Sound and quahog dredge fisheries. However, the negative economic impacts for some trawlers were mitigated by their ability to participate in the biomedical fishery[8]. Note, in 2023 DMF voluntarily reduced its annual horseshoe crab quota by 25,000 crabs (from 165,000 crabs to 140,000 crabs annually) to offset growth in the biomedical fishery and cap total mortality at near 2022 levels.

The early quota closure in 2023 was driven in part by an unprecedented spike in early season bait harvest. Landings during the proposed closure period (April 15 – June 7) approached 85,000 crabs[9], which is substantially higher than what we have experienced in recent years (Figure 11). There are several likely reasons as to why this occurred. Uncertainty regarding the future of the hand-harvest fishery may have driven an increase in fishing effort and activity, particularly as final rules were not approved by the MFAC until mid-May and did not go into effect until mid-July. Additionally, the early season bait quota usage was likely artificially inflated by biomedical demand from firms seeking to utilize bait crabs that they bled and returned to the bait market ("rent-a-crab"); this harvest is counted toward the 140,000-crab bait quota. It was also reported that the elevated early season crab harvest caused market gluts that may have in turn reduced bait availability during this fall's conch pot fishery and contributed to the at-sea releases of crabs in May, of which many ultimately washed ashore dead near Stage Harbor. The spawning closure and trip limit proposals outlined above should result in the quota being spread out over the fishing season thereby avoiding market gluts and early season closures. In the biomedical fishery, landings are still being tallied, but DMF expects the biomedical annual quota to be essentially taken. Note that in 2024 we will have enhanced reporting, as all commercial horseshoe crab fishers—both bait and biomedical—will be required to report the landings electronically on a daily basis.

DMF has monitored horseshoe crab fisheries since 2000, including collection of size and sex data from both the bait and biomedical harvest streams. This includes sampling within Associates of Cape Cod, which was the only biomedical firm in the state from 1974 to 2022. The addition of Charles River Laboratories in 2022 brought more attention from the public. Some members of the public were frustrated by a lack of transparency in the biomedical fishery due to confidentiality laws and requested DMF increase observation of the fishery. The biomedical industry, frustrated by misinformation being spread about their operations, also requested DMF conduct more sampling trips. In addition to continuing to collect biological data within the biomedical facilities, DMF began observing biomedical collection trips, holding areas, and biomedical release trips, conducting 50 trips in total (Table 3). Eleven different DMF scientists collected data on over 11,000 crabs. Information collected included mortalities, biomedical recaptures, size, and sex. The data have not been completely analyzed yet, but the number of observed mortalities from collection to release was very low.

Right-sizing Bait Harvest

I am interested in managing the bait fishery for horseshoe crabs in a manner that considers local demand for bait. Based on bait usage surveys and reported pot haul data, DMF estimates the Massachusetts' conch pot fishery likely required about 136,000[10] horseshoe crabs per season during the ten-year period from 2013 – 2022. However, during the most recent five-year stanza (2018 – 2022), the mean number of horseshoe crabs needed was about 107,000. This usage is generally in-line with the current horseshoe

[8] Out of abundant precaution, DMF does not currently allow shellfish dredge boats to participate in the biomedical fishery as there are concerns that are not currently well understood about how this rigid, metal gear may impact the overall health, fitness, and survivability of horseshoe crabs.

[9] DMF obtains gear type data through harvester reports and 2023 harvester data will not be available until the spring of 2024. However, given our understanding of how this fishery functions, the increase in landings during the spring of 2023 is likely attributable to hand harvest.

[10] Estimated number of crabs needed to supply bait for Massachusetts whelk pot hauls was derived by multiplying the number of annual whelk pot hauls by 0.33 (a third of a crab). Most respondents to a 2016 survey by DMF and ASMFC of commercial whelk harvesters claimed they used a quarter of a female crab, or half a male. Using sex data provided by bait harvesters, there are 2 females harvested for every male. Using a weighted mean by sex, the average bait use is estimated to be 0.33 crabs per trap.

crab quota. However, the declining trend in pot hauls (Figure 12), declining channeled whelk stock conditions, and international market issues likely portend further declines in the pot fishery. Should this bear out over the next few years, I may consider proposing further reductions to the bait quota.

Attachments

1. January 9, 2023 Petition from Horseshoe Crab Conservation Association to DMF
2. October 26, 2023 Letter from Massachusetts Audubon to Commissioner O'Shea

Table 1. Massachusetts Spawning Beach Survey trends by survey site, region, and survey period (day or night).

Beach	Region	Time of Day	2023 vs Median	10-year trend	5-year trend
Duxbury	Cape Cod Bay	Day	below	decreasing	increasing
Duxbury	Cape Cod Bay	Night	above	decreasing	increasing
Long Beach	Cape Cod Bay	Day	below	NA	decreasing
Long Beach	Cape Cod Bay	Night	below	NA	increasing
Millway	Cape Cod Bay	Day	below	increasing	increasing
Millway	Cape Cod Bay	Night	above	increasing	increasing
Long Pasture	Cape Cod Bay	Day	above	increasing	increasing
Sanctuary Beach	Cape Cod Bay	Day	below	increasing	increasing
Indian Neck	Cape Cod Bay	Day	below	decreasing	decreasing
Indian Neck	Cape Cod Bay	Night	below	increasing	decreasing
Great Island	Cape Cod Bay	Day	below	increasing	increasing
Priscillas Landing	Outer Cape Cod	Day	above	increasing	decreasing
Marsh 2-3	Outer Cape Cod	Day	above	increasing	increasing
Erica's Beach	Outer Cape Cod	Day	below	increasing	decreasing
Stage Harbor	Nantucket Sound	Day	NA	NA	NA
Stage Harbor	Nantucket Sound	Night	NA	NA	NA
Bass River	Nantucket Sound	Day	below	NA	increasing
Bass River	Nantucket Sound	Night	above	NA	increasing
Monomoy	Nantucket Sound	Day	equal	increasing	NA
Monomoy	Nantucket Sound	Night	below	increasing	NA
Warrens Landing	Nantucket Sound	Day	above	increasing	increasing
Warrens Landing	Nantucket Sound	Night	above	increasing	increasing
Tashmoo	Nantucket Sound	Day	NA	increasing	NA
Tashmoo	Nantucket Sound	Night	NA	increasing	NA
Tahanto	Buzzards Bay	Day	NA	increasing	increasing
Tahanto	Buzzards Bay	Night	NA	increasing	NA
Swifts Beach	Buzzards Bay	Day	below	decreasing	decreasing
Swifts Beach	Buzzards Bay	Night	below	decreasing	increasing

*The fourth column indicates whether the 2023 survey data point was above or below the time series median for that site. The fifth and sixth columns indicate whether the survey linear trends are increasing or decreasing over the last ten or five years. Positive trends (above time series medians or increasing survey trends) are shaded green. Negative trends (below time series medians, decreasing trends) are shaded red. Unshaded areas are either equal to the time series median, or inadequately sampled.

Table 2. Hand harvest landings (in number of horseshoe crabs) by season 2010 - 2023

MA HSC Bait Hand Fishery Annual Landings (# of Crabs)		
YEAR	**JAN 1 - MAY 31**	**JUN 1 - DEC 31**
2010	43,815	5,612
2011	28,882	6,303
2012	50,030	3,049
2013	59,716	10,681
2014	49,640	27,395
2015	55,168	12,898
2016	54,554	9,381
2017	46,113	22,441
2018	43,149	27,494
2019	52,044	27,142
2020	54,833	12,019
2021	39,525	13,421
2022	30,342	10,069
2023	77,000*	N/A

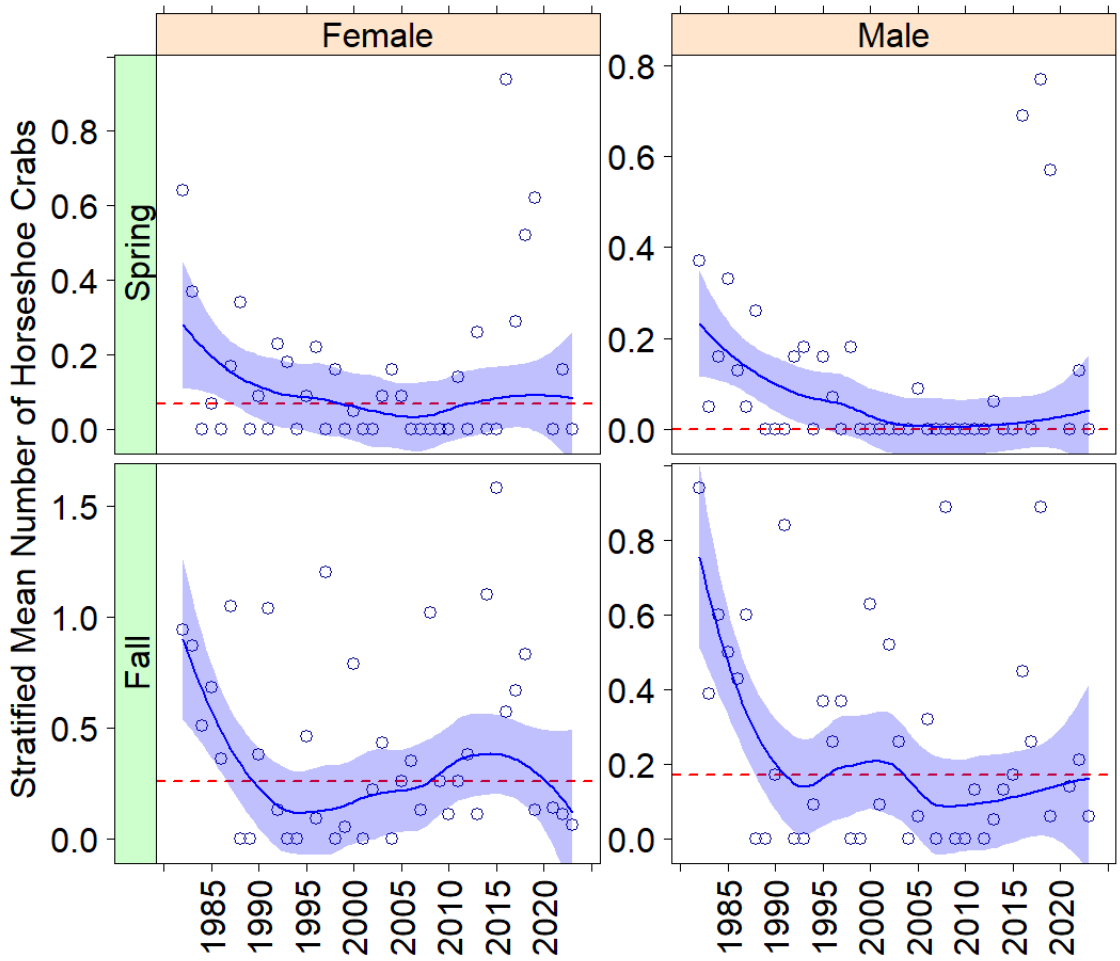
Data Source: MA Trip-Level Reports and NMFS VTRs, as of 10/2/2023, *except for 2023 which is estimated from SAFIS eDR reports and historical gear types of the harvesters named in the dealer reports.

Table 3. Summary of sampling conducted and horseshoe crabs observed by DMF (2023).

	# of 2023 Trips	# of Crabs Observed
Bait market sampling	4	984
Biomedical market sampling	9	3,009
Collection Trips	9	>1,685*
Pen Checks	14	2,645
Release Trips	14	2,898
Total	50	>11,221*

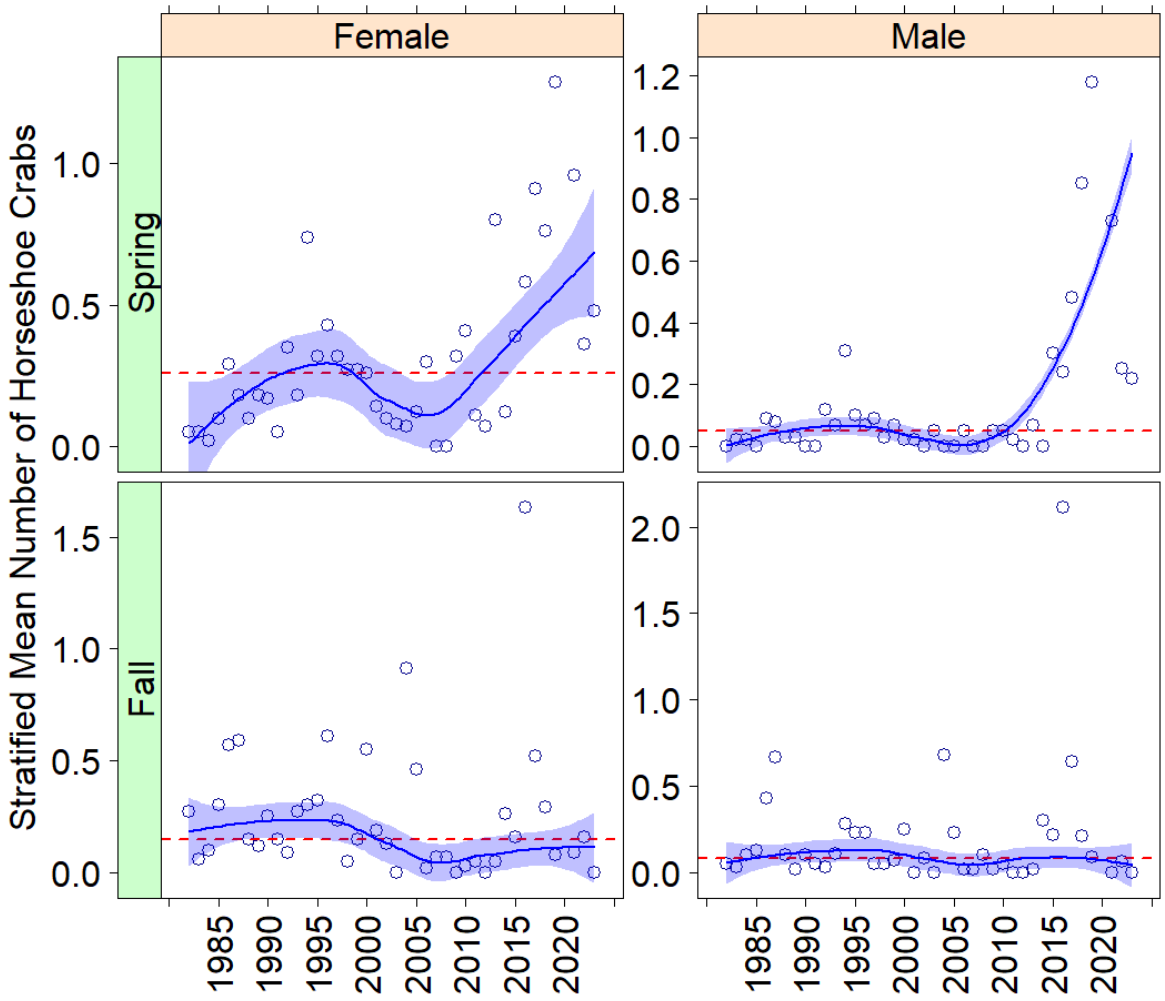
* Most 2023 sea sampling trips (collection trips) have not been transcribed yet, so the number of crabs observed is expected to increase substantially once audio recordings of trips are transcribed.

Figure 1. Stratified mean number of horseshoe crabs per tow 1982-2023 – North of Cape Cod



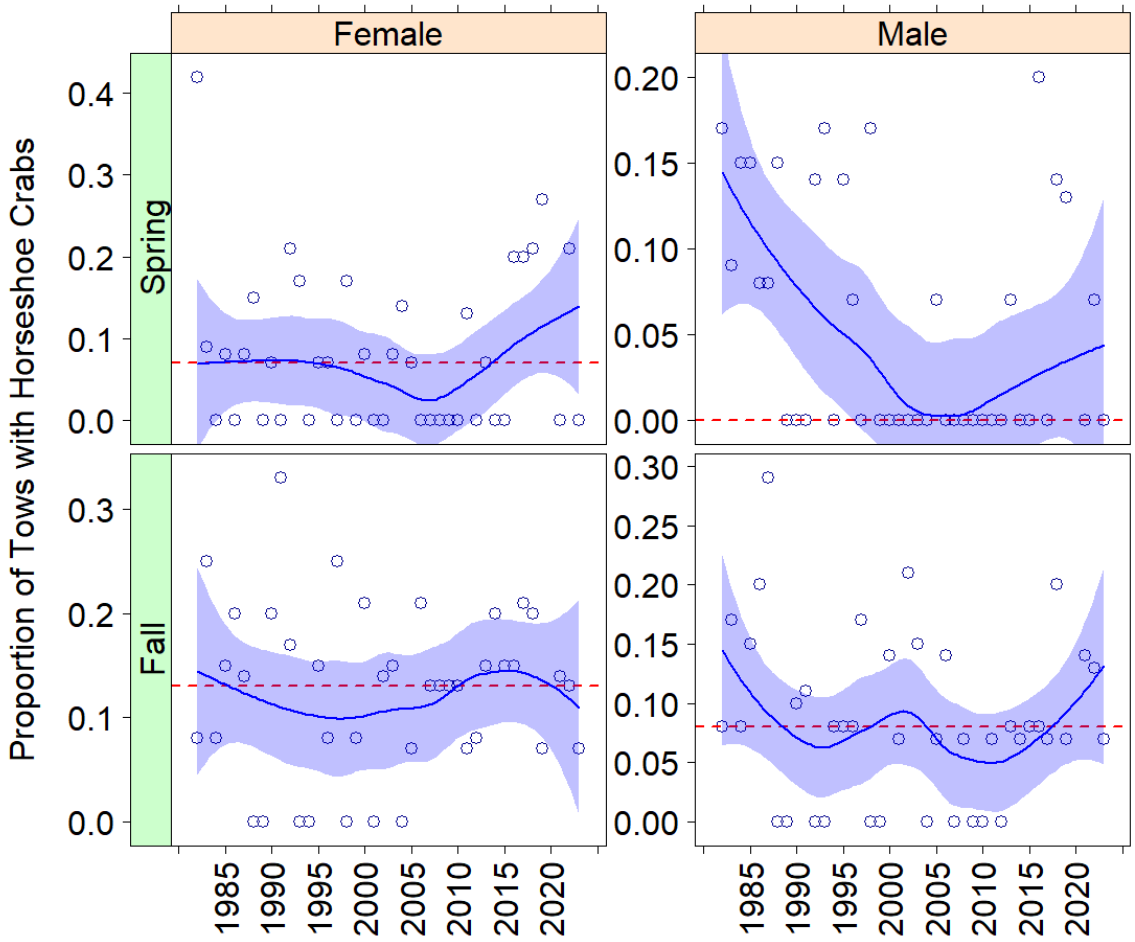
DMF Trawl Survey North of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 2. Stratified mean number of horseshoe crabs per tow 1982-2023 – South of Cape Cod



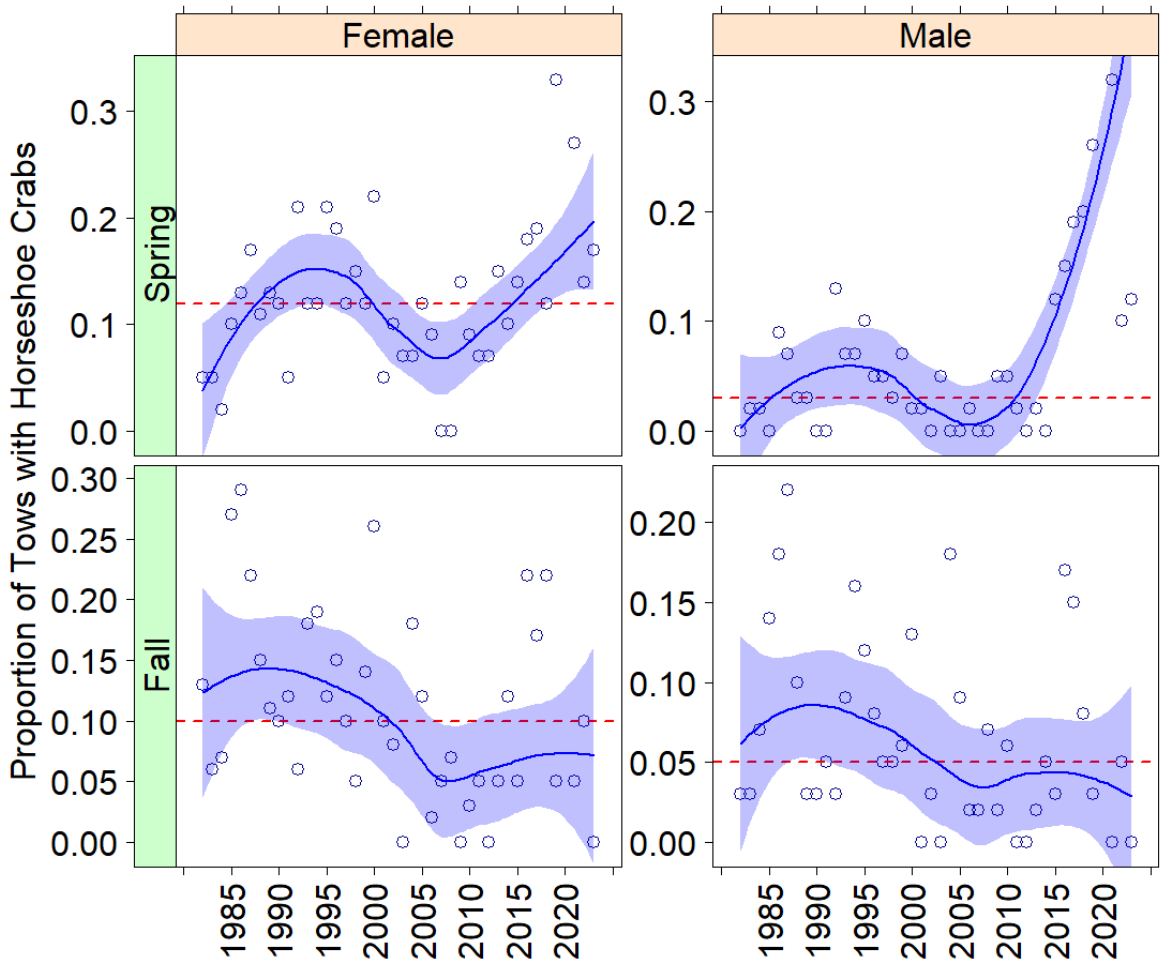
DMF Trawl Survey South and East of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 3. Proportion of tows with horseshoe crabs present 1982-2023 – North of Cape Cod



DMF Trawl Survey North of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 4. Proportion of tows with horseshoe crabs present 1982-2023 – South of Cape Cod



DMF Trawl Survey South and East of Cape Cod. Red, dashed line is the time series median, loess fitted line is blue, the light blue shaded area is an approximate 95% confidence interval for the loess fitted line. Note there was no survey conducted in 2020 (spring or fall) due to Covid.

Figure 5. Proportion of 2022 horseshoe crab landings in bait fishery by region

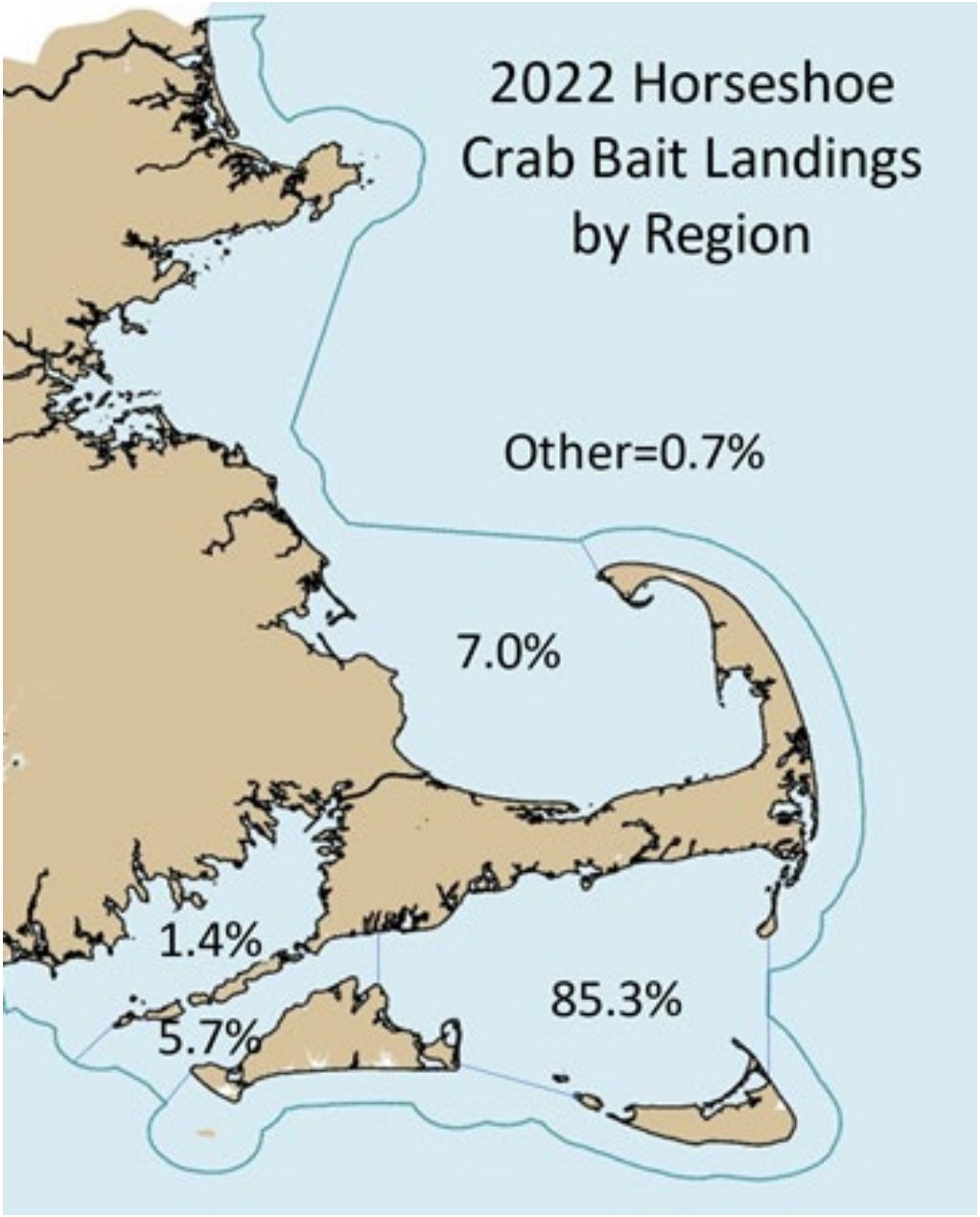


Figure 6. Cumulative percent of spawning females observed by date during spawning beach surveys North of Cape Cod, 2015-2022

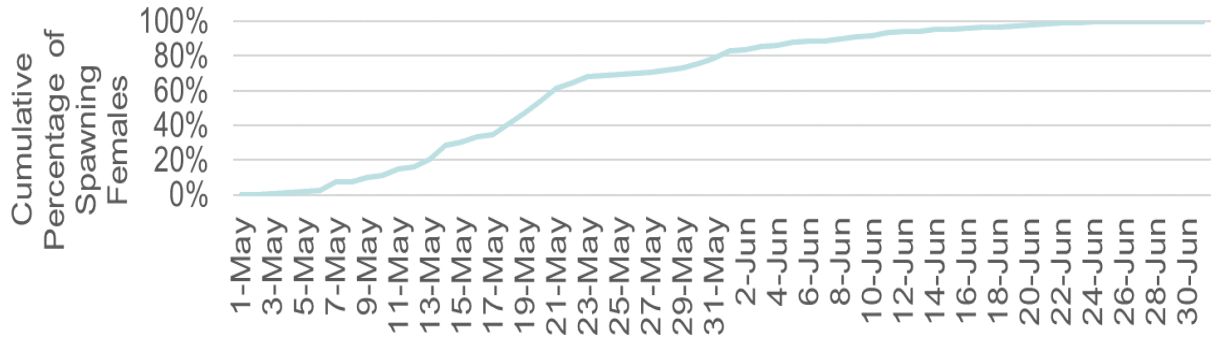


Figure 7. Cumulative percent of spawning females observed by date during spawning beach surveys in Southern Massachusetts and Outer Cape Cod, 2015-2022

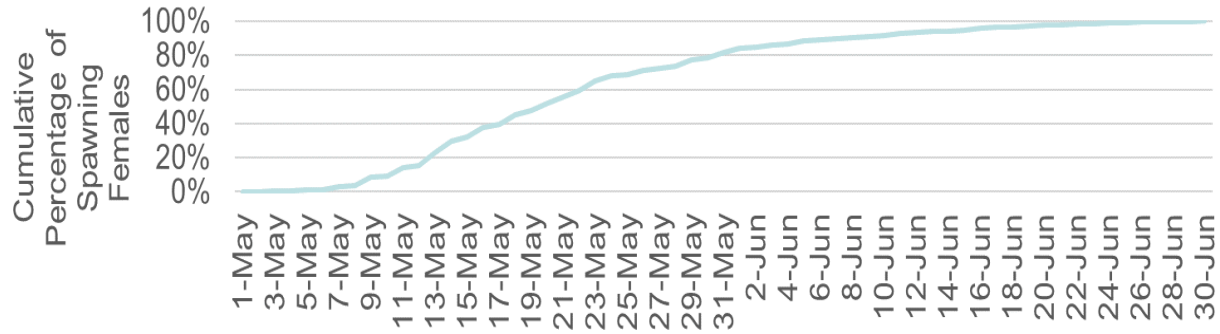
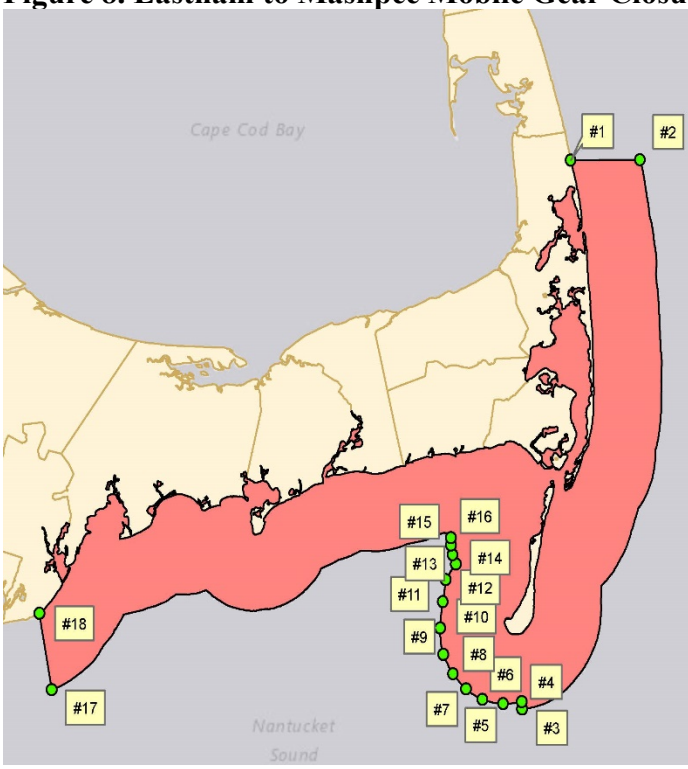


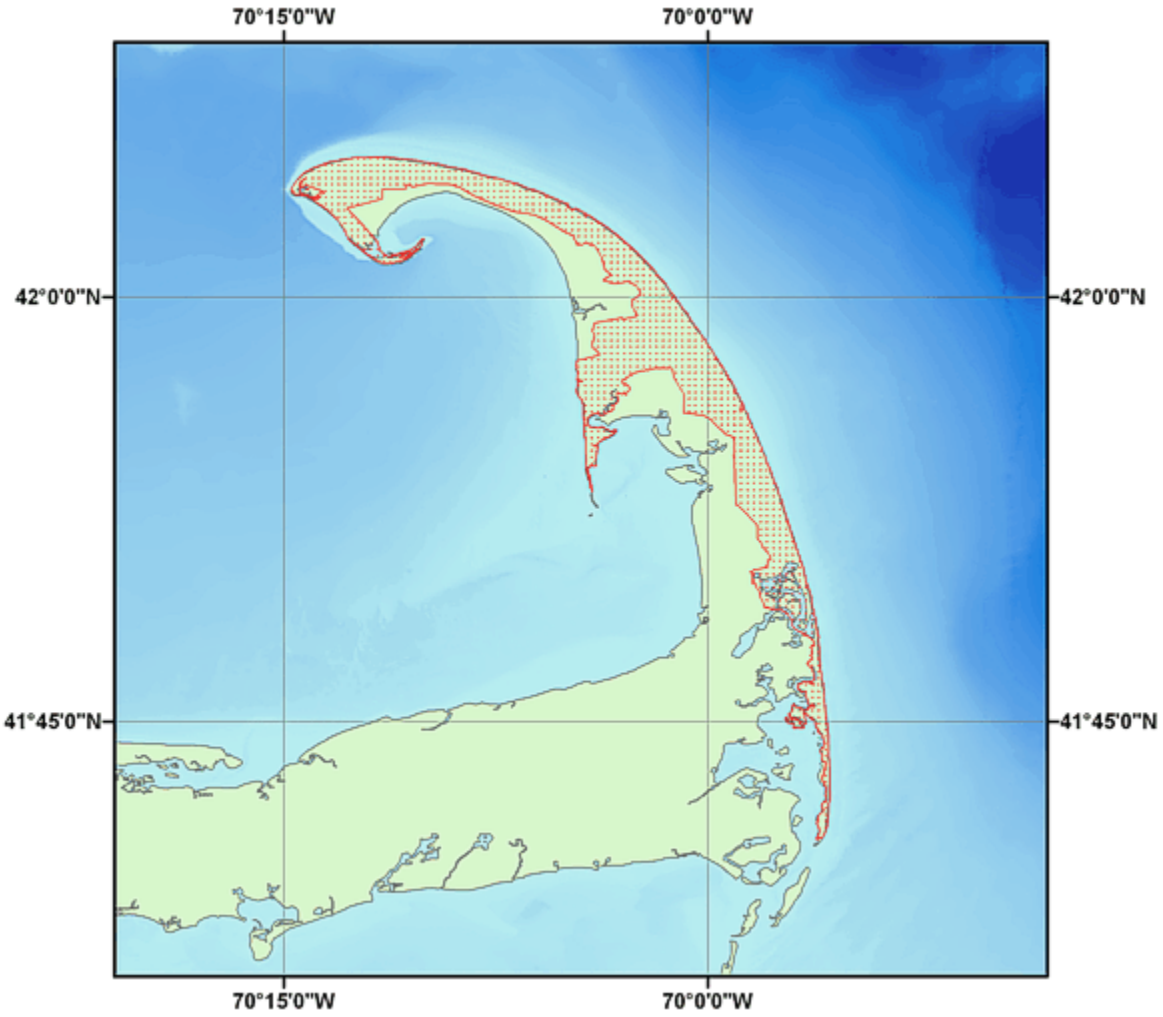
Figure 8. Eastham to Mashpee Mobile Gear Closure, May 1 – October 31 (322 CMR 4.06)



Coordinates for Area 5 Eastham to Mashpee Closure May 1 - October 31				
Points	Latitude Deg Min Sec	Longitude Deg Min Sec	Latitude Deg Dec Min	Longitude Deg Dec Min
1	41° 51' 40" N	Nauset Beach	41° 51.666'	Nauset Beach
2	41° 51' 40" N	3 nautical mi line	41° 51.666'	3 nautical mi line
3	3 nautical mi line	70° 00' 00" W	3 nautical mi line	-70° 0.000'
4	41° 29' 48" N	70° 00' 00" W	41° 29.805'	-70° 0.000'
5	41° 29' 43" N	70° 01' 05" W	41° 29.724'	-70° 1.087'
6	41° 29' 54" N	70° 02' 20" W	41° 29.904'	-70° 2.335'
7	41° 30' 19" N	70° 03' 19" W	41° 30.323'	-70° 3.313'
8	41° 30' 56" N	70° 04' 05" W	41° 30.926'	-70° 4.079'
9	41° 31' 43" N	70° 04' 40" W	41° 31.718'	-70° 4.665'
10	41° 32' 47" N	70° 04' 52" W	41° 32.780'	-70° 4.870'
11	41° 33' 51" N	70° 04' 42" W	41° 33.842'	-70° 4.702'
12	41° 34' 45" N	70° 04' 31" W	41° 34.748'	-70° 4.510'
13	41° 35' 22" N	70° 03' 55" W	41° 35.372'	-70° 3.915'
14	41° 35' 45" N	70° 04' 06" W	41° 35.749'	-70° 4.098'
15	41° 36' 09" N	70° 04' 13" W	41° 36.147'	-70° 4.211'
16	41° 36' 26" N	3 nautical mi line	41° 36.431'	3 nautical mi line
17	3 nautical mi line	70° 28' 05" W	3 nautical mi line	-70° 28.086'
18	Succonessett Point	70° 28' 50" W	Succonessett Point	-70° 28.828'

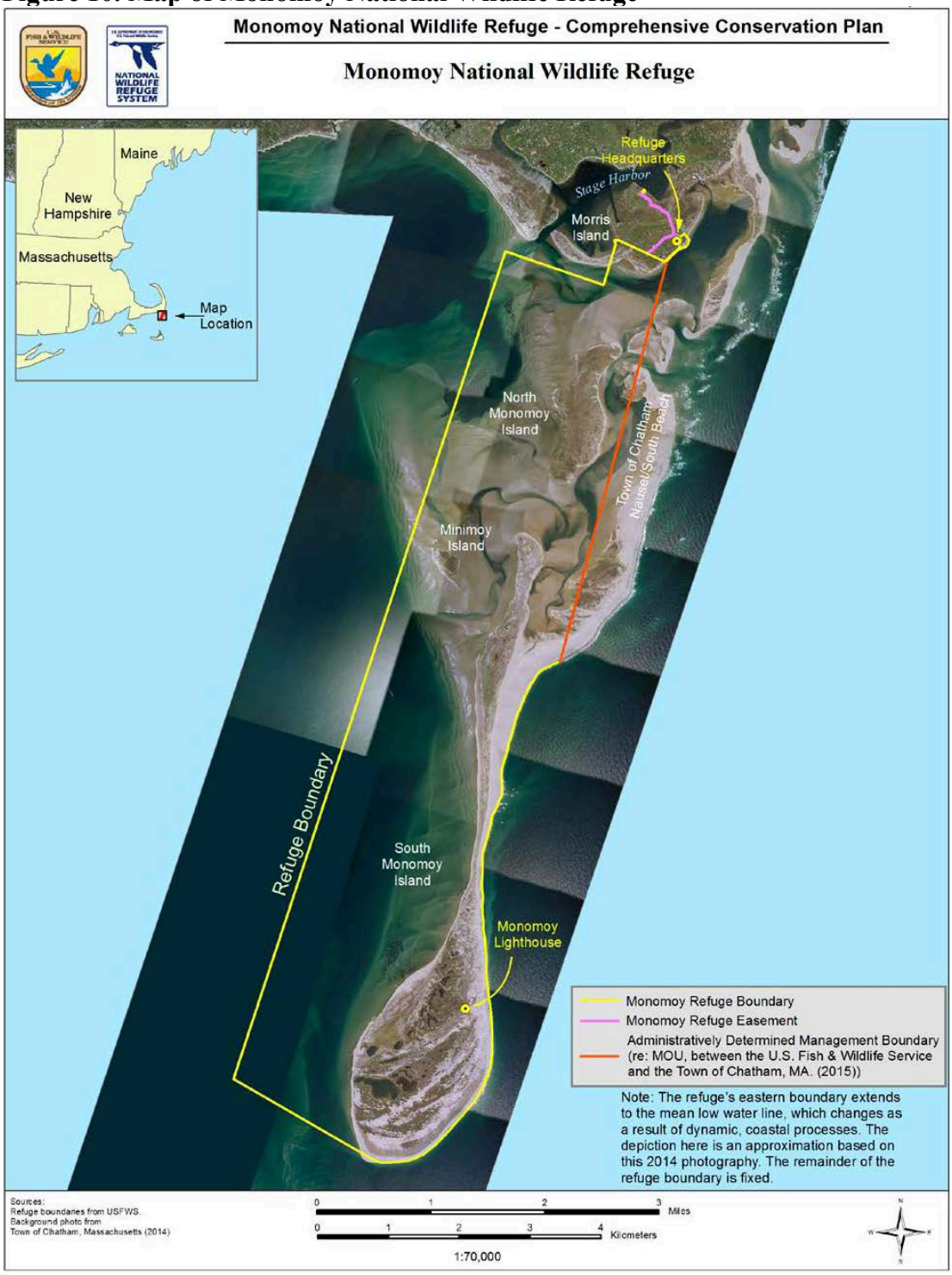
Mobile Gear Closure

Figure 9 Map of Cape Cod National Seashore Boundary



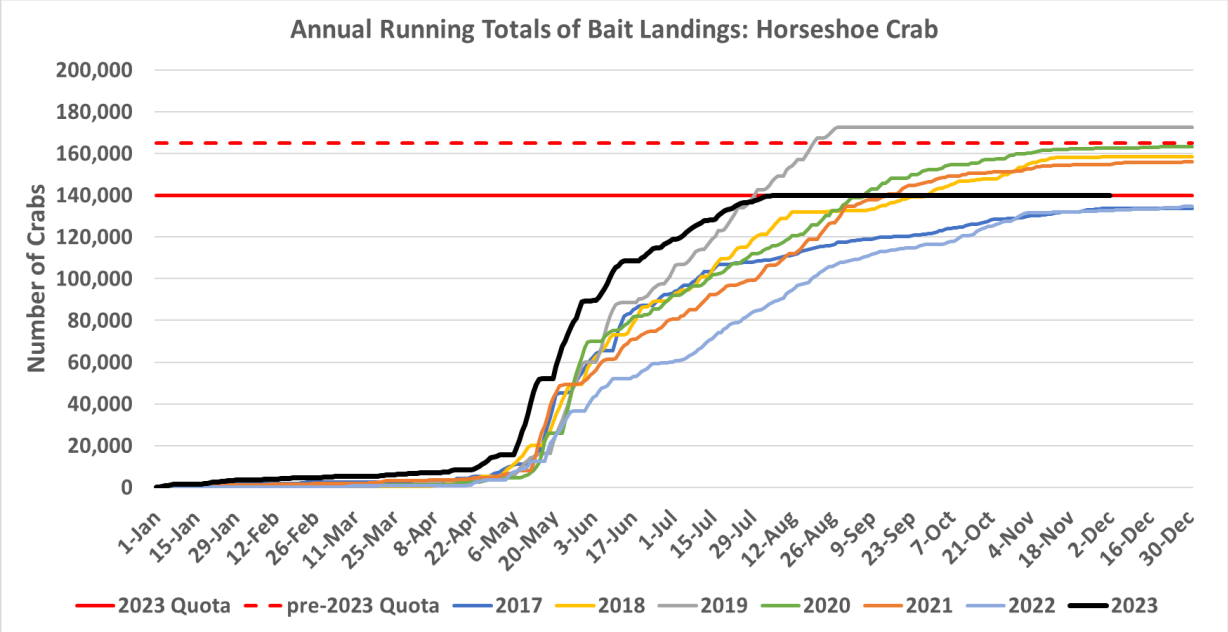
Source: USGS Publications Warehouse

Figure 10. Map of Monomoy National Wildlife Refuge



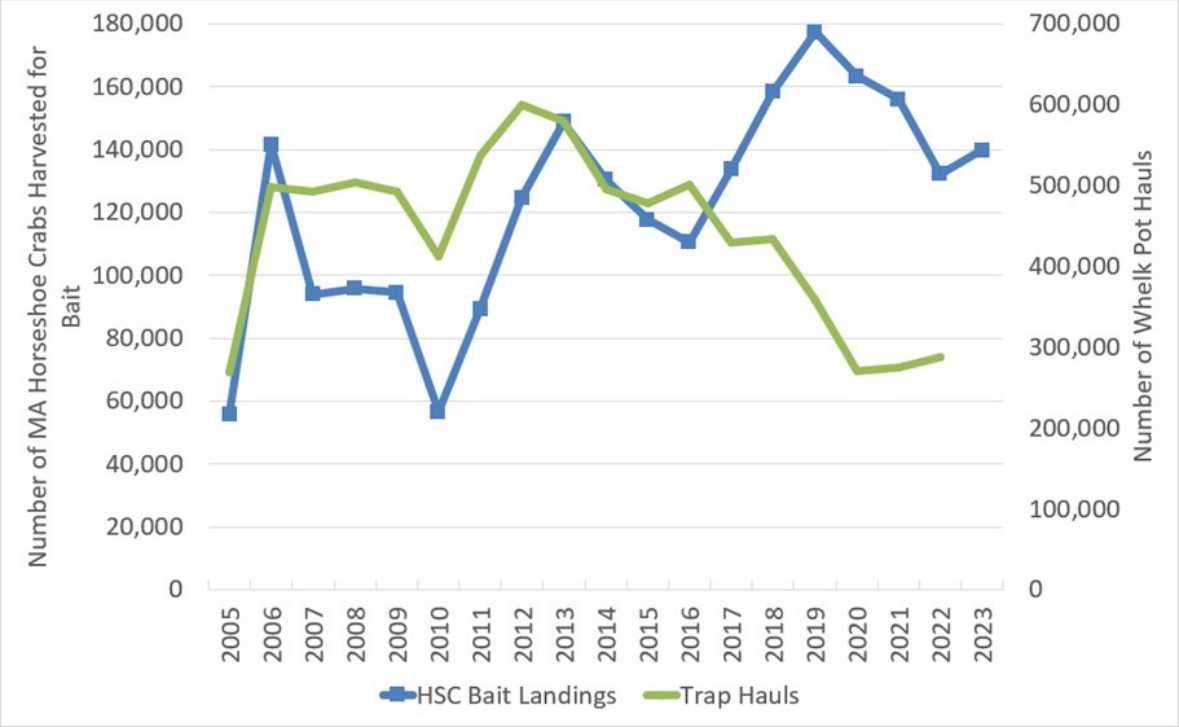
Source: Map 1.1, Monomoy Wildlife Refuge Comprehensive Conservation Plan

Figure 11. Running total of horseshoe crab bait landings (2017-2023).



Data Source: SAFIS eDR as of 12/7/2023.

Figure 12. Annual trends (2005-2023) in pot hauls in the conch pot fishery compared to landings in the horseshoe crab bait fishery.



Source: MA commercial catch reports and NMFS VTRs (whelk trap hauls) and SAFIS dealer reports (horseshoe crab landings).

Attachment 1

Horseshoe Crab Conservation Association
P.O. Box 2334
Orleans, MA 02653-2334



Brenda J. Boleyn
Duxbury

Hillary Cressey, DA
Barnstable

Denise Ellis-Hibbett
Boston

Mark Faherty
Harwich

Daniel G. Gibson III, PhD
Falmouth

Charles "Stormy" Mayo III, PhD
Provincetown

Thomas J. Novitsky, PhD
Falmouth

Sarah Martinez
Barnstable

Erik J. Paus
Brewster

Robert L. Prescott
Orleans

Maureen A. Ward
Barnstable

Paul J. Ward
Barnstable

January 9, 2023

Dan McKiernan, Director
Derek Perry, Invertebrate Fisheries
Mass. Division Marine Fisheries
836 Rodney French Blvd.
New Bedford, MA 02744

Dear Dan and Derek,

Thank you for welcoming a petition from the Horseshoe Crab Conservation Association. We appreciate the complexity of your task and the opportunity to participate.

Sincerely,

Brenda J. Boleyn
for the HCCA

The goal of the Horseshoe Crab Conservation Association is to ensure long-term sustainable populations of horseshoe crabs in the coastal estuaries and embayments of Massachusetts through increased regulatory attention and broadened public education.

Horseshoe Crab Conservation Association
P.O. Box 2334
Orleans, MA 02653-2334



Petition to MA DMF to Protect HSC Spawning

09 Jan 2023

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Maureen A. Ward
Barnstable

Paul J. Ward
Barnstable

For information contact:
Paul Ward at
wardpj@aol.com

The Horseshoe Crab Conservation Association proposes the Massachusetts Division of Marine Fisheries (MA DMF), under their authority to regulate the harvest of the American Horseshoe Crab, *Limulus polyphemus*, modify the current rule by designating June 15 as the earliest start date of each year for both bait and biomedical harvest with exceptions granted only for approved research studies.

On 17 Feb 2016, the International Union for Conservation of Nature and Natural Resources (IUCN) listed the American Horseshoe Crab as "Vulnerable", one level from "Endangered", in their Red List Assessment of Threatened Species. Their report noted, "Continuing decreases were found in… the New England… areas… Thus, *Limulus* is Vulnerable at the species level with potential for assignment to a higher risk category at the regional and sub-regional levels, particularly the… New England area… Specifically, population reductions over 40 years were projected to be… 92% in New England…" In addition, the IUCN 21 July 2022 Green List Assessment of species recovery and the impact of conservation designates *Limulus* as 'Moderately Depleted' and indicates the Population Trend as 'Decreasing'.

With the implementation of this start date, selected as a consensus date where essentially most horseshoe crab spawning in Massachusetts waters is complete, some current MA DMF rules, i.e., the 'lunar closure' and vessel quotas, could be dropped. MA DMF bait harvest quotas, as well as continued monitoring and enforcement of industry Best Management Practices, should be retained.

The proposed rule change aligns with current harvest moratoria and post-spawning start dates in New Jersey, Delaware, Maryland, and Virginia. The abundant spawning activity and successful population on the Monomoy National Wildlife Refuge, where no harvest is allowed, provides an indication of the expected results if this rule change is implemented.

DMF trawl survey data for Nantucket Sound support that commercial fisheries (bait and biomedical) will not be harmed by this change. Since horseshoe crabs harvested for bait are often frozen, collection following a June 15 start date will have no impact on bait availability.

This rule change will, over time, rebuild the diminished stock and ensure the sustainability of horseshoe crabs for all stakeholders.

Supporting Information:

Horseshoe crabs are a public asset and have economic value for biomedical stakeholders and fisheries stakeholders. Just as important, horseshoe crabs have intrinsic value as an essential part of our history, our stories, and as a distinct part of Massachusetts' natural and cultural heritage.

A more robust horseshoe crab population will support endangered birds and various marine species that depend on horseshoe crab eggs and juveniles for food.

This rule change recognizes that horseshoe crab spawning is not rigidly linked to the lunar cycle but is moderated by weather and will occur throughout the spawning season. After 12 years of lunar closures there has been no consistent sign of improved spawning data.

Bait species should be abundant and quick to reproduce. Horseshoe crabs are neither which makes spawning protection even more imperative.

Attachment 2

Mass Audubon

October 26, 2023

Commissioner Thomas O'Shea
Department of Fish and Game
100 Cambridge Street, 6th Floor
Boston, MA 02114

Re: Biodiversity Goals and Horseshoe Crab Population Recovery

Dear Commissioner O'Shea:

We were deeply appreciative last month when Governor Healey signed Executive Order No. 618 on Biodiversity Conservation in Massachusetts, which sets the stage for the Commonwealth to lead the nation in addressing the biodiversity crisis. Full implementation and the realization of the goals envisioned by E.O. 618 will be a generational challenge, and will involve all the agencies under your purview, and many outside of it as well.

Mass Audubon and our 160,000 members and supporters will be reliable allies for this work. Meanwhile, we have established a shorter-term goal for the recovery of the horseshoe crab. We now look to your leadership as we chart out immediate steps to set the population on an upward trend, and hope you will connect that goal with your broader coastal and marine ecosystem biodiversity goals.

As you know, horseshoe crabs are a valuable and widely-recognized element of our rich natural heritage, and they play a vital role in our marine ecosystems, by bringing important nutrients into the water column, and supporting many other species in severe decline, such as the federally-threatened Red Knot and the endangered Loggerhead Sea Turtle. In addition, in states with larger populations, they are the center of a multi-million-dollar ecotourism industry, and there is potential for a similar industry here in Massachusetts. And, as you know, their blood is used to make the only FDA-approved test for endotoxin contamination of certain drugs and medical devices, and as of yet, the U.S. has not approved synthetic alternatives to the lysate derived from horseshoe crab blood for these tests.

For all of these reasons, we recommend and request that you empower and order the Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP), and the Division of Marine Fisheries (DMF) to advance the population recovery of the horseshoe crab.

First steps toward that recovery should include:

- Prohibition on harvesting horseshoe crabs during the spawning season (Jan 1 through June 30)
- Phasing out of the bait harvest[1]

[1] Horseshoe crabs are used as an optional bait in the channeled whelk fishery, which DMF has determined is depleted and overfished. https://www.mass.gov/info-details/whelks-and-whelk-management

208 S. Great Road • Lincoln, MA 01773 • 978-831-9682 • mmanion@massaudubon.org • massaudubon.org

- Improved performance standards and monitoring for the lysate bleeding industry to reduce mortality and sublethal impacts on horseshoe crabs
- Interagency coordination and increased funding for monitoring horseshoe crabs' status, relationship to other species including shorebirds, and progress toward recovery goals
- Inclusion of plans for protecting and restoring horseshoe crabs' habitats including breeding beaches in the context of climate impacts (sea level rise and coastal erosion), in addition to the importance of these habitats for other species like coastal nesting birds

Today, the population in Massachusetts is a fraction of naturally occurring levels. While precise data on historic populations is not known, it is clear that this species has declined considerably since the mid-1900s due to historical eradication programs, and more recently from coastal development, sea level rise, loss of critical beach and salt marsh habitats, and nitrogen pollution, in addition to direct harvest for the bait and biomedical fisheries.

Maintenance of the existing, artificially-low population level has been the goal of fisheries regulations in Massachusetts. This goal needs to be substantially revised and replaced with a goal for recovery of the species. Moreover, the declining size of females and low presence of juveniles in many locations, in a species that takes a decade to reach reproductive maturity, indicates that even the current population level is likely at risk. The trawl data are not reliable indicators of the overall population, as they are subject to several sampling factors that have not been considered in application of this information.

As you also know, many wildlife activists and advocacy organizations in Massachusetts are supporting a listing under the Massachusetts Endangered Species Act of the horseshoe crab by the NHESP. While we recognize that the horseshoe crab likely does not meet the regulatory criteria for listing, Mass Audubon nonetheless urges the agencies to act decisively to put the species on track toward recovery of populations levels.

We seek partnership with you, your office, and your sister agencies on the realization of what we hope are shared goals for this important and remarkable species.

Sincerely,

Michelle Manion



VP of Policy and Advocacy

Jocelyn Forbush



Chief Conservation Officer

Exhibit Q

Shellfish Broker, LLC
Chatham Fish Pier
Chatham, Massachusetts

August 8, 2025

To:
Dan McKiernan, Director
Massachusetts Division of Marine Fisheries
251 Causeway Street, Suite 400
Boston, MA 02114

Subject: Request to Transfer Horseshoe Crab Bait Quota to Biomedical Quota

Dear Director McKiernan,

Thank you for your consideration of the following:

Shellfish Broker, LLC respectfully submits this request to the Division of Marine Fisheries and petitions the agency to consider a management action that would allow for rolling transfers of horseshoe bait quota into the biomedical category to be determined at intervals during the remainder of the fishing season starting September 1st as well as to re-evaluate the horseshoe crab bait fishery as a whole. This would help to ensure that this valuable and tightly regulated marine resource is utilized to its fullest benefit — economically, scientifically, environmentally, and locally. We also believe that any transfer should remain in the open catch market and not divided between any firms, a policy which would result in the hobbling of the biomedical fishery and the unnecessary suppression of the Free Market.

We understand the sensitivity of the horseshoe crab topic, but we would like to know if it would be possible to have this subject placed on the September 2025 MA Marine Fisheries Advisory Commission (MFAC) for public discussion. We would of course make ourselves available for any discussion of the topic, and / or updates, prior to the MFAC's regularly scheduled meeting.

Demonstrated Success of Best Management Practices

Over the past several years, we have adhered to and actively cooperated with all DMF regulations and oversight. We were pleased to see the findings from the March 14, 2025 Horseshoe Crab Science Meeting, which affirmed that current biomedical harvest operations — including those conducted by Shellfish Broker — are among the most scientifically monitored and responsibly executed fisheries in the Commonwealth.

Key findings include:

• Zero mortality observed among 3,117 horseshoe crabs sampled at-sea by DMF biologists in 2024.
• Pre-bleeding mortality rates were just 0.0% for males and 1.0% for females, per DMF biomedical pen and lab sampling.
• Post-release mortality rates at the time of release were similarly low: 0.6% for males and 1.7% for females.
• A portion (3%) of discarded mobile gear crabs were found to bear biomedical marks from the prior year — strong evidence of post-bleeding survivability.
• No dead crabs were reported across any of the seven 2024 at-sea sampling trips.
• Biomedical harvest now represents the third most observed fishery in Massachusetts, with 35 dedicated trips and nearly 11,000 crabs sampled in total by DMF staff.

These findings confirm what responsible operators already know: this fishery is being conducted in a sustainable, controlled, and transparent manner. Shellfish Broker, in particular, operates under tightly defined daily limits, weather-dependent access, and consistent interaction with DMF staff and inspectors.

Waste in the Bait Sector and Diminishing Demand

We would like to comment on the unused portion of the 140,000-crab bait quota, which continues to be underutilized in Massachusetts and, in some cases, sold out of state.

In 2024, our company accounted for 59,909 bait crabs. Of these:

- 29,909 were sold, by us, at a deeply discounted price of $0.50 per crab to another Massachusetts dealer (an 83% discount from the $3.00 retail price), who either froze them or sold them out of state. The true disposition of these crabs is unknown as the DMF does not track secondary, or tertiary sales.

- The remaining 30,000 were sold, by us, at $0.50 per crab to an out-of-state conch dealer where there was strong demand. This is obviously not our preference as we would like to supply Massachusetts fishermen and not subsidize other states fisheries.

We have a strong and knowledgeable background in the bait industry and it is our opinion that if Massachusetts conch fishermen had strong demand for these bait crabs (which we have yet to experience) it is logical to posit that they might have seized this historic pricing opportunity. They did not and they still do not purchase crabs in any quantity, although we have made the bait resource readily available to them. To date, we have sold at $0.25 cents, approximately 3,000 horseshoe crabs to a small handful of Massachusetts conch fishermen, this while incurring freezer costs. In our opinion, this indicates systemic overcapacity in the

bait quota, which stands in contrast to the highly regulated biomedical quota that will run up against harvest ceilings.

In the early part of this season, we handled a small amount of bait horseshoe crabs in order to keep two bait horseshoe crabbers working. One was a hand harvester who has relied on hand harvesting for decades (his season ended in early July as the crabs moved offshore) and the other is a quahog dragger that is currently bringing in small quantities of crabs (40-70) each time he goes, weather permitting. Other than that, we are not handling or purchasing any bait horseshoe crabs. The bulk of our 100% Rent-A-Crab participation ended in early July and we have mainly focused on our allotment of the biomedical quota, while trying to accommodate the quahog dragger's extremely small catch. We do have out of states markets for the bait Rent-A-Crabs but we are trying to conserve these for Massachusetts conch fishermen as we believe this is the DMF's preference.

Compounding this issue is the overall decline in the Massachusetts whelk fishery, which is the primary consumer of bait horseshoe crabs. The following table, to the best of our knowledge, highlights the stark downward trends:

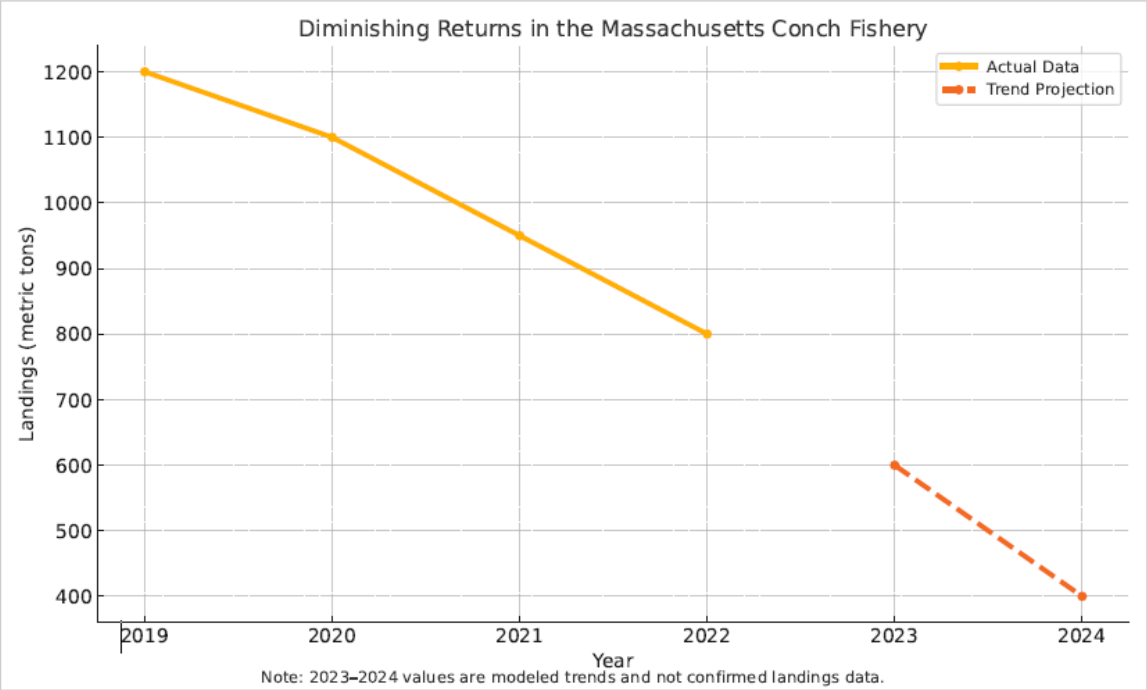
Year	**Active Permits**	**Traps Hauled**
2018	79	433,351
2023	47	249,725

This represents a 40% drop in active permits and a 30% decline in trap effort over just five years. In a fishery with declining participation and yield, maintaining a static bait quota—especially one that is routinely sold outside the state—is both biologically and economically inefficient.

This not only represents missed opportunities for Massachusetts to add value locally but also exposes us to criticism from environmental stakeholders regarding inefficient and non-localized use of our precious marine resources.

For the 2025, we are experiencing very small demand for bait horseshoe crabs. On June 18th 2025 we sent out a marketing postcard mailer to all 127 Massachusetts Conch Permit holders alerting them that we are offering conch bait for an even deeper discount at $0.25 per crab (a 91.7% discount from the $3.00 retail price) as mentioned above. We are not surprised by the uninterested response. To date we have received 3 inquiries to our efforts which equate to a 2.36% response rate. Separately, we have not received inquiries from any Massachusetts conch dealers which indicates that their freezers are possibly full, a familiar scenario that has happened in the past. We also hear that the per pound price for conch is fluctuating around $2.50 in Massachusetts and it is in shambles in Rhode Island where the price has been reported to be at $2.25 / lb.

The data and trend seem clear.



Possible Negative Impact of the Fluke Fishery on the Horseshoe Resource

Another issue that warrants reconsideration is the continued allowance for fluke trawler vessels to retain up to 300 bait horseshoe crabs per day as bycatch. While this policy may have initially been implemented to reduce waste, its practical effect appears to do the opposite. Despite this daily retention allowance, the actual in-state demand for bait horseshoe crabs has plummeted. In 2024, as mentioned, our company accounted for 42.79% of the total bait quota allocation (59,909 crabs used in the Rent-A-Crab Program), and of those approximately 30,000 were shipped out of state due to lack of interest from Massachusetts conch fishermen. This year, we are witnessing a similar severe market trend, offering bait crabs at $0.25—well below market average—yet, receiving virtually no interest, while refraining from entering the conch market directly. Meanwhile, fluke vessels continue to remove large quantities of crabs, not for their own use but to sell into a conch bait market that shows little evidence of genuine demand. Why is this happening? Is the bulk of this horseshoe resource being shipped out of state? This raises concerns of economic inefficiency, unnecessary mortality, and biological waste, especially when these crabs could have been released alive or redirected to the biomedical sector in Massachusetts, where they are used non-lethally for critical global health applications.

Would it not be preferable to retain, for Massachusetts, a resource that is so important rather than having it shipped out of state where it will experience 100% mortality and as conch bait for commercial fishermen that are not even Massachusetts residents? We urge the Division to evaluate whether this bycatch quantity policy remains justified in light of current market realities, and whether it is contributing to a pattern of overharvest and misallocation of an ecologically and medically important species.

The Rent-A-Crab Effect

Another significant point worth emphasizing is the role of the Rent-A-Crab program, which admirably and conservation mindedly seeks to maximize the utility of the 140,000 bait crab quota by encouraging that horseshoe crabs first be bled for biomedical use before being frozen and sold as conch bait. We support this approach and, in fact, have acted in direct alignment with these conservation goals. In 2024, Shellfish Broker handled approximately 59,909 bait horseshoe crabs through the Rent-A-Crab program—likely the highest number of any bait dealer in the state. If we conservatively hypothesize that others processed a comparable amount, that could mean that roughly 120,000 of the 140,000 bait crabs passed through the Rent-A-Crab program before going to bait. However, that leaves at least 20,000 (most likely much more) bait horseshoe crabs that were never utilized for LAL extraction and were instead sold directly into a conch bait market that continues to show weak or negligible demand. This represents a lost opportunity—not just from a conservation standpoint, but also from a biomedical one. It is worth noting that when DMF imposed the 200,000-crab limit on the biomedical fishery and split it evenly between two entities, we were left with no viable option but to participate in the Rent-A-Crab program if we wished to acquire crabs. In effect, our involvement supported DMF's stated conservation objectives, yet we cannot access additional biomedical quota under current regulations despite our demonstrated capacity, infrastructure, and track record of responsible harvest and processing. A policy modification allowing for the flexible transfer of unused bait quota to biomedical use would help ensure that every harvested crab contributes meaningfully to both conservation and public health goals.

The bait fishery filled its quota again in 2024 and closed early, despite being ranked just 28th in economic value among all Massachusetts commercial fisheries. These diminishing returns contrast sharply with the rising demand and critical importance of LAL (Limulus Amebocyte Lysate) testing in pharmaceutical, medical device, and vaccine safety.

Further, the 100% mortality rate of bait use, compared with the excellent onshore survival rate in biomedical use, speaks volumes. If conservation and a sustainable fishery is a shared goal, then diverting unused quota, at a certain time, to the biomedical sector is not only a rational choice — it's an environmental imperative.

The Horseshoe Crab Derby

Derby-Style Fishery Concerns: Addressed and Disproven

When the DMF initially established equal biomedical quotas for two entities, it did so in part to prevent a 'derby-style' fishery. The DMF's earlier prudent rationale for splitting the quota equally between processors – to prevent such a derby – may have been understandable at the time but has proven unnecessary in practice. This concern, to the best of our knowledge, has not materialized. But if the DMF believes that it has, we would be grateful if the Division could identify any issues so that we could be proactive and address them. After four years of operating in this space, we believe that the biomedical horseshoe crab fishery has remained stable, methodical, and respectful of trip limits. Bio-vessels under our management operate 5 trips per week at most, weather permitting, with low crew capacity and limited gear. There is no race to land. In fact, our pace is defined by handling and processing capacity and strict adherence to quota and sampling schedules — often in coordination with DMF biologists on board. Our infrastructure ensures a consistent, moderate harvest pace and categorically refutes any suggestion of a "derby-style" fishery. That noted, we are indeed thankful for the DMF's oversight and guidance at inception without which, the industry may not be where it is today, in our opinion, the model for best practices for Horseshoe Crab Husbandry along the Eastern Seaboard. The data now available through the DMF's own monitoring programs affirms that our operations are responsible, predictable, and consistent with best management practices and that we have not, and do not, engage in derby-style fishing practices. In contrast, we would urge the Division to determine whether or not there may be derby-style fishing practices in horseshoe crab bait fishery.

The Vital Role of Horseshoe Crab–Derived LAL in Global Health

As the DMF is well aware, the biomedical use of horseshoe crabs — specifically the extraction of Limulus Amebocyte Lysate (LAL) — plays an irreplaceable role in the protection of human health worldwide. LAL is used to test for the presence of bacterial endotoxins, which can cause fatal reactions if introduced into the human bloodstream. Every injectable pharmaceutical product — from insulin and cancer therapies to COVID-19 vaccines — must pass LAL testing to meet U.S. FDA and global pharmacopeial standards.

This includes not just drugs, but medical devices such as catheters, surgical implants, dialysis tubing, and IV fluids, as well as many vaccines, biologicals, and cell therapies. Without LAL, it would be impossible to safely manufacture or distribute these products. Disruption to the LAL supply chain could risk widespread contamination, product recalls, or

halted production lines — with grave consequences for global public health.

While synthetic alternatives like recombinant Factor C (rFC) have emerged and are used in some limited applications, the FDA does not yet consider rFC equivalent to LAL for all safety testing. Moreover, LAL remains the only universally accepted, validated, and scalable method for endotoxin detection across global markets. As a result, the demand for LAL is projected to remain strong or even increase, especially with the global expansion of biotech, biologics, and advanced therapies.

The role that the Massachusetts biomedical harvest plays in this global supply chain is both critical and highly regulated. Our ability to continue meeting this demand — safely and sustainably — requires flexible policies that promote full utilization of our existing quota framework. Redirecting unused bait quota toward biomedical use supports not only fisheries efficiency, but also global health resilience.

A Solution That Reflects Responsible Stewardship Of A Sustainable Resource

We respectfully propose that the Division adopt a flexible framework whereby projected unused bait quota may be transferred or reallocated to the biomedical sector under limited, regulated circumstances. This mechanism could be seasonal, conditional on evidence of unused bait quota by a certain date/s, or implemented administratively via permit-specific adjustments.

This proposal does not call for increased overall harvest, but rather for responsible reallocation of unused bait quota to maximize utility, reduce waste, and support a sector that has proven its sustainability and value as a local Massachusetts fishery through data and deed.

In Closing, we are grateful for your stewardship of Massachusetts' marine resources and for the Division’s continued commitment to science-driven management. Thank you for considering this request.

Respectfully,

Jamie Bassett, Founding Partner
Matthew Belson, Founding Partner
Shellfish Broker, LLC
Chatham, Massachusetts

Citations:

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Exhibit R

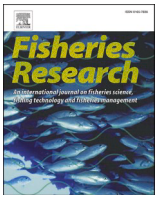
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Laboratory investigations into alternative baits for the channeled whelk (*Busycotypus canaliculatus*) fishery

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ABSTRACT

Channeled whelks (*Busycotypus canaliculatus*) are fished along the eastern US coast using traps typically baited with pieces of female horseshoe crabs (HSC; *Limulus polyphemus*). However, the use of HSC as bait, particularly females, is controversial because they are already heavily fished because their blood contains a substance that the biomedical industry uses to manufacture a test for pathogenic bacteria. Therefore, the goals of this study were to: 1) develop a cost-effective alternative bait that does not rely on HSCs and 2) determine whether whelk are more attracted to female HSC pieces than male HSC pieces. Seventeen different baits were tested in a total of 209 laboratory bait trials over a total of 5496 h. Whelk attraction to bait was measured by using time-lapse video to quantify the amount of time a whelk interacted with a bait bag containing one of the baits. While whelks were attracted to many of the alternative baits tested, those containing surf clam and green crab parts, were the most attractive. One such alternative bait composed of green crabs and clam bellies (60 GC/40 CBel Mix) resulted in greater whelk interaction than female HSC Prosoma did over a 24 hr period (mean ± SEM whelk interaction time: 60 GC/40 CBel Mix, 9.31 ± 0.52 hrs; female HSC Prosoma, 8.4 ± 4.6 hrs). We also found that male HSC pieces were as attractive to whelks as female HSC pieces, indicating that it may be possible to reduce fishing pressure on female HSCs to aid in conservation of the species. Field testing of these alternative baits is currently underway to determine whether these laboratory findings successfully translate to commercial fishing operations.

1. Introduction

The channeled whelk (*Busycotypus canaliculatus*) is a large, predatory marine gastropod ranging from Cape Cod, MA to Cape Canaveral, FL, but is most abundant in the northern range and supports an important commercial fishery (Edwards and Harasewych, 1988; Walker et al., 2008). In Massachusetts, channeled whelk landings peaked in 2012 at 3.6 million lbs, valued at $6.3 million (Nelson et al., 2018). However, since 2012 landings have decreased and, in 2022, only 917,618 lbs were landed, worth $3.8 million (MA DMF, 2022; SAFIS, 2023). Catch per unit effort (CPUE; lbs of legal-size whelk per trap haul) also has steadily decreased, indicating the resource likely is being overexploited (MA DMF, 2022). Despite this decline in landings, channeled whelk remains an attractive target species, compared to other marine gastropods, due to its high market price and demand. Since 2005, the price per pound has increased by over 280% and, in 2022, reached $4.14 per lb (Nelson et al., 2018; SAFIS, 2023).

Channeled whelks are predatory gastropods and have been reported to feed on bivalves such as northern quahogs (*Mercenaria mercenaria*), soft-shell clams (*Mya arenaria*), surf clams (*Spisula solidissima*), and blue mussels (*Mytilus edulis*), and are scavengers which allows them to be caught using baited traps (Magalhaes, 1948; Nelson et al., 2018). Fishers generally bait these traps with their own unique blend of ingredients, which can include green crabs (*Carcinus maenas*), blue mussels, herring (*Clupea harengus*), and surf clam bellies, along with a consistent component, American horseshoe crabs (*Limulus polyphemus*). These baits are packed into mesh bait bags to decrease bait consumption by scavengers and increase bait longevity (Fisher and Fisher, 2006; Edmundson, 2021). While the baits vary from fisher to fisher, 91% of whelk fishers report using horseshoe crab (HSC) parts as bait and it is typically used as

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the primary attractant (Fisher, 2015; ASMFC, 2017), even though HSCs are not a natural forage species for channeled whelks (Walker et al., 2008) and other predatory gastropods (Ferrari and Targett, 2003).

Channeled whelk chemoreception shapes feeding behavior and, more specifically, whelk behavior when interacting with bait and traps in the fishery. However, despite the economic importance of channeled whelks, little is known about their chemically-mediated behaviors. Like many aquatic animals, whelks utilize chemoreception to detect odors in the water that emanate from bivalves, carrion, predators, and other whelks (Croll, 1983). Previous studies have evaluated channeled whelk attraction to, and feeding on, a variety of substances such as HSC pieces, horseshoe crab hemolymph, HSC eggs, and mussel "juice" (Rohrkasse and Atema, 2002; Ferrari and Targett, 2003).

Using HSCs for whelk bait is controversial due to multiple relevant groups harvesting this ecologically and economically important species. HSCs play an important ecological role, acting as bioturbators in the intertidal zones of North American estuaries and their carapace also serves as a substrate for a variety of epibionts (Kraeuter and Fegley, 1994; Botton, 2009; Lee, 2010). Second, their eggs are an important food source for threatened birds (i.e., red knot (*Calidris canutus*)) migrating along the Atlantic coast of the US (Mizrahi and Peters, 2009). The migrations of these shore birds are timed with the spawning of HSCs because of the importance of HSC eggs as a major protein source (Clark et al., 1993; Walls et al., 2002; Yang et al., 2019). Third, HSCs are critical for the biomedical industry because a component of their blood, *Limulus* Amebocyte Lysate (LAL), is used to test for pathogenic bacteria on medical devices and in the ingredients used to make vaccines (Novitsky, 1984, 2009). Obtaining sufficient LAL from HSCs requires capturing and bleeding many HSCSs; 718,809 HSCs were collected for bleeding in 2021 (ASMFC, 2022). Although HSCs utilized to extract LAL are returned to the water after they are bled, 30% of their blood volume is removed prior to their release, which can have both sublethal and lethal consequences (Kurz and James-Pirri, 2002; James-Pirri et al., 2012; Owings et al., 2019, 2020). Leschen et al. (2006) found that mortality in female HSCs increased by 19.5–26.8% depending on if the female was released immediately after bleeding or held in the facility overnight. In 2021, the mortality rate associated with the collection and bleeding of crabs for the biomedical industry was estimated to be 15.6% (ASMFC, 2022). There are also sublethal impacts of the bleeding process. Many bled HSCs are less active than control HSCs held in captivity (Anderson et al., 2013; Owings et al., 2020) and female HSCs that are bled and released during the breeding season spawn less often than females that are not bled (Owings et al., 2020; Watson et al., 2022). In New England, HSCs already are at elevated risk due to overharvesting and habitat fragmentation (Smith et al., 2017) and are predicted to diminish by at least 30% within the next 40 years (Smith et al., 2016). As a result, in recent years conservationists have argued to limit the use of HSCs as both a bait for whelk and eel fisheries and as a source of LAL for the biomedical industry.

HSC 'pieces' are the most expensive channeled whelk bait ingredient currently and can cost anywhere from $0.50-$2.00 per trap, depending on the size of the crab. Currently, female HSCs are preferred by fishers as bait for channeled whelk but for unsubstantiated reasons; it could be because females are larger than male HSCs or because they contain a putative chemoattractant found in their eggs (Ferrari and Targett, 2003). Regardless, the fisher's preference for female HSCs as bait puts an additional pressure on HSC populations. Furthermore, if HSC populations continue to decline, whelk fishers likely will face rising bait prices and less availability.

The concept of moving towards sustainable baits is not unique to the channeled whelk fishery. Recently, the American lobster (*Homarus americanus*) fishery in the Gulf of Maine has had to adapt to a decline in the availability of Atlantic herring (*Clupea harengus*) (Stoll et al., 2021). As a result, the fishery diversified its baits which now include Atlantic menhaden (*Brevoortia tyrannus*), Acadian redfish (*Sebastes fasciatus*), haddock (*Melanogrammus aeglefinus*), and other species, as well as manufactured baits, depending on the season (Stoll et al., 2021). In Prince Edward Island, Canada, an alternative lobster bait made from a mix of fresh and processed pelagic fish in a biodegradable casing has been tested and resulted in similar lobster catches to the traditional baits; although further evaluations are still necessary to determine if it is a viable alternative (Patanasatienkul et al., 2020). Green crabs have also been explored as a bait for American lobster and found to be as attractive as traditional baits in laboratory studies (Ryan et al., 2014). Alternative baits also have been investigated for sand crab (*Ovalipes puncataus*) (Archdale and Kawamura, 2011) and snow crab (*Chionoecetes opilio*) fisheries (Araya-Schmidt et al., 2019). In the search for alternative and more sustainable baits, some fisheries processing waste streams have been evaluated as sustainable sources of alternative baits either by using solid wastes or by deriving bioattractant concentrates from waste products (Albalat et al., 2009; Reeve et al., 2010; Masilan and Neethiselvan, 2018; Masilan et al., 2022). Solid wastes from brown crab (*Cancer pagurus*) processing were found to be successful in attracting common whelk (*Buccinum undatum*) compared to herring (Albalat et al., 2009; Reeve et al., 2010). Working directly with the channeled whelk industry to verify the results of our laboratory findings and providing accurate bait cost data will be necessary if the alternative whelk baits that showed promise in the laboratory are to be accepted by the industry.

The transition away from the use of HSC pieces as a bait in the channeled whelk fishery and towards more sustainable alternatives could relieve pressure on HSC populations. Further, the incorporation of fisheries processing wastes or invasive species into channeled whelk bait could increase the sustainability of multiple New England fisheries. In addition, if male HSC pieces are as attractive to whelks as females, fewer females could be used for bait in the channeled whelk fishery, which could help maintain the reproductive potential of HSCs. Therefore, the goals of this study were to: 1) evaluate alternative baits that could be more sustainable, yet equally as attractive to whelks, as HSC pieces and; 2) determine if channeled whelks are more attracted to female versus male HSCs.

2. Materials and methods

2.1. 24-Hour trials

2.1.1. Whelk collection

Channeled whelks (n = 96) were sourced from the Marine Biological Laboratory (MBL) in Woods Hole, MA in October 2020 and commercial whelk fishers in Martha's Vineyard, MA in June 2021. Whelks were held in ambient seawater conditions (temperature: 11.2 – 21.0 °C; salinity: 25 – 35 ppt), flow-through, seawater tanks at the University of New Hampshire Coastal Marine Laboratory (CML) in New Castle, NH. Whelks were labeled by painting a large identifying number on them with a mixture of superglue and black nail polish as well as affixing a glue-on shellfish tag (Hallprint Glue-on Shellfish Tags: FPN 8 mm × 4 mm). Individual whelk shell length, width, and lip width were measured to the nearest 0.01 cm according to Edmundson (2016). Only those whelks identified as legal-sized in accordance with Massachusetts state regulations for 2021 (internal width of 7.9 cm (3 $^{1}/_{8}$") and at least 15.2 cm (6″) long and 3.9 cm (1 ½") high; MA DMF, 2021) were used in the study; 96 whelks were used with an average width of 89.30 (± SD 7.07) mm and average length of 159.97 (± SD 0.94) mm. Whelks were fed surf clam bits or crushed green crab ad libitum to communal tanks prior to individual bait trials as described below. Whelks were not fed for the one week prior to the start of the bait trials.

2.1.2. Bait trials

Bait trials were conducted at the CML in four 0.91-m diameter circular tanks supplied with constant, flow-through, unfiltered saltwater pumped from the mouth of the adjacent Piscataqua River, NH. Water was kept at a depth of approximately 25.4 cm. Experiments were

conducted once water temperature exceeded 13 ℃, from June 21 to December 2, 2021 and from June 13 to August 6, 2022. Water temperature and salinity were monitored once daily with a Fisherbrand Handheld Analog Clinical Refractometer and an EXTECH Instruments waterproof thermometer, respectively (Tables 1 and 2). Daytime lighting was provided by overhead lights fitted with 12 W T8 Total Tubes (Average Ambient Lux was 113.63 ± 14.75; RemPhos by Light Efficient Design: RPT-B-TOTALTUBE-T8-G3–4FT-835-A) programmed on a diurnal cycle with the lights on from 07:00–19:00 h (12-hour light:12-hour dark).

Tanks were set up with PVC pipes secured across the top to allow for the suspension of one mesh bag containing bait and one negative control bag containing inert glass marbles, hung on the opposite sides from each other at the midpoint of the tank (Fig. 1). The locations of the bait and control bags in the tank were switched every other trial. A steady constant flow of ambient seawater (approximately 0.82 L/sec) was maintained for the duration of the experiment. Water inputs for tanks were fastened to the central standpipe and had t-shape openings to disperse centripetal flow in the tank. A digital time lapse camera (Brinno, TLC200 Pro) was secured above each tank and set to take a picture every four seconds for the duration of the trials (Fig. 1). Clip-on lights with red, 40 W Ecosmart LED bulbs were attached to each tank to enhance visibility during nighttime filming. Red lights were programmed to turn on at 18:00 and off at 07:00 while overhead laboratory lights were off.

Whelks were randomly assigned to experimental tanks and bait trials, while ensuring that each whelk was not used in consecutive trials. Some individual whelks (n = 56) were used more than once but whelks were not tested for the same type of bait twice.

For each trial, whelks were placed in the experimental tanks (1 whelk/tank) at 10:00 and allowed to acclimate for two hours. Each trial began at approximately noon with the addition of one experimental and one negative control bait bag per tank. Experimental bait bags contained one bait type (Table 1) weighing approximately 100 g and 25 g of inert glass marbles to keep the bait bag from floating. Negative control bags contained 125 g of glass marbles to mimic the weight of the baited bags but without olfactory cues. Baits and controls were used only in bait-type-specific bags to avoid potential cross-contamination of baits and inadvertently affect whelk behavior. Baits were stored in the refrigerator for no more than four weeks or in the freezer. Frozen baits were thawed for three hours prior to use.

Following the completion of each trial, all whelks were removed, and each tank was drained and rinsed with freshwater thoroughly before being refilled. The bait bags also were emptied and rinsed with freshwater. Whelks were given a minimum of a 1-month rest period between bait trials and individuals were not reused until all other whelks had been used in trials.

2.1.3. Baits evaluated

The following single bait ingredients and bait mixes (using the base recipe described in Wakefield, 2013 but with different attractants) were tested as follows (Table 1). All baits were refrigerated unless noted.

1) Horseshoe crab pieces (HSC): collected at low tide by hand from Great Bay Estuary, NH (male HSC in 2021, females in both years) and also purchased from the MBL (male HSC in 2022). Whole frozen female HSCs were broken into quarters and males in half, following

Table 1
Summary of bait ingredients and alternative bait mixes tested in 24-hr trials with the bait name abbreviation, number of trials (n), mean bait weight, trial dates, mean daily temperature, and mean daily salinity. Standard deviations for means are reported in parentheses.

Bait	Bait Abbreviation	n	Bait Weight (g)	Dates Tested	Temperature (°C)	Salinity (ppt)
¼ Female Horseshoe Crab - Prosoma	FHSC Prosoma	15	193.30 (± 81.17)	June 6 – September 27, 2021 June 15 - July 7, 2022	16.1 (± 1.50)	30.1 (± 2.36)
¼ Female Horseshoe Crab - Opisthosoma	FHSC Opisthosoma	15	155.54 (± 34.63)	June 10 - October 1, 2021 June 13 - July 16, 2022	14.8 (± 1.82)	30.8 (± 2.55)
½ Male Horseshoe Crab	Male HSC	22	197.51 (± 80.79)	June 25 - September 25, 2021 June 21 - August 2, 2022	15.2 (± 2.20)	30.8 (± 2.42)
Ground Green Crab	Ground GC	14	99.80 (± 0.99)	June 6 - August 7, 2021	15.5 (± 1.38)	29.2 (± 1.96)
Whole Crushed Green Crab	Whole GC	8	102.16 (± 11.80)	July 11 – August 3, 2021	18.2 (± 1.21)	25.4 (± 0.74)
Clam Bits (Processing Waste)	Clam Bits	12	100.46 (± 1.10)	June 21 - August 7, 2021	15.4 (± 1.73)	29.4 (± 2.17)
Refrigerated Ground Green Crab + Alginate Binder	GC Mix	9	103.93 (± 3.76)	August 20 - September 14, 2021	18.2 (± 1.60)	33.2 (± 2.14)
Refrigerated Clam Bits + Alginate Binder	CBits Mix	9	103.92 (± 4.61)	August 20 - September 14 2021	18.2 (± 1.62)	33.2 (± 2.14)
Refrigerated Poultry Byproduct Meal + Alginate Binder	Poultry Mix	9	108.34 (± 10.38)	July 15 - July 25, 2021	18.2 (± 1.08)	26.6 (± 2.13)
Whole Surf Clam	Surf Clam	8	106.89 (± 12.20)	July 26 – August 5, 2021	17.6 (± 1.54)	25.9 (± 1.81)
Refrigerated Ground Green Crab + Clam Bits + Alginate Binder Mix	Refrigerated GC + CBits Mix	10	104.88 (± 7.20)	August 20 - October 10, 2021	18.0 (± 1.62)	33.4 (± 2.07)
Frozen Ground Green Crab + Clam Bits + Alginate Binder	Frozen GC + CBits Mix	10	108.97 (± 19.83)	August 20 - September 16, 2021	17.9 (± 1.81)	33.3 (± 1.98)
Frozen Male Horseshoe Crab Hemolymph + Brewer Spent Grains + Alginate Binder Mix	HSC Blood Mix	10	102.54 (± 2.35)	June 17 – July 22, 2022	14.9 (± 1.13)	31.3 (± 0.82)
Frozen Ground Green Crab + Clam Bits + Brewer Spent Grains + Alginate Binder Mix	GC + CBits + BSG Mix	9	105.42 (± 5.98)	June 20 – July 19, 2022	15.2 (± 1.04)	31.5 (± 0.71)
Clam Bellies	Clam Bellies	10	102.65 (± 2.57)	June 5 – June 16, 2022	13.5 (± 1.26)	30.8 (± 0.79)
Frozen Clam Bellies + Alginate Binder Mix	CBel Mix	9	103.61 (± 8.14)	July 7 – July 19, 2022	15.6 (± 0.53)	31.7 (± 0.50)
Frozen 60% Whole Green Crabs + 40% Clam Bellies + Alginate Binder Mix	60 GC/40 CBel Mix	10	96.45 (± 7.87)	August 1 – August 6, 2022	17.1 (± 0.48)	31.7 (± 0.48)

Table 2
Summary of 48-hour bait testing trials with the bait name abbreviation, the number of trials (n), mean bait weight, trial dates, mean daily temperature, and mean daily salinity. Standard deviations for means are reported in parentheses.

Bait	Bait Abbreviation	n	Bait Weight (g)	Dates Tested	Temperature (°C)	Salinity (ppt)
¼ Female Horseshoe Crab	FHSC	10	156.97 (± 56.27)	October 1 – December 2, 2021	12.2 (± 2.49)	34.7 (± 0.48)
Frozen Ground Green Crab + Clam Bits + Alginate Binder	Frozen GC + CBits Mix	10	100.62 (± 0.92)	September 10 – November 12, 2021	13.4 (± 1.74)	33.7 (± 1.49)

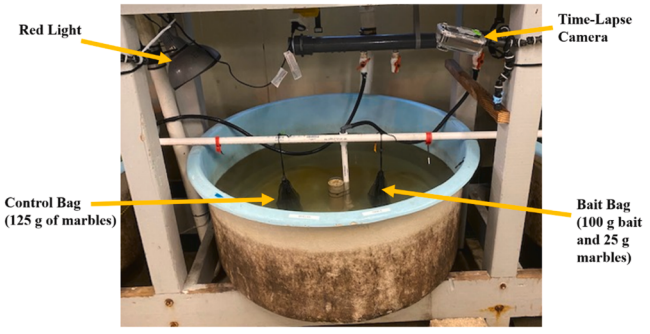


Fig. 1. Experimental tank set up for the bait trials at the UNH Coastal Marine Laboratory. Single whelks were tested in 0.91 m diameter circular tanks supplied with constant, flow-through, raw saltwater. One mesh bag containing bait and one negative control bag containing inert glass marbles were suspended on opposite sides from each other at the midpoint of the tank A digital time lapse camera (Brinno, TLC200 Pro) recorded whelk movements. A clip-on light with a red, 40 W Ecosmart LED bulb enhanced visibility during nighttime filming.

common practices utilized by whelk fishers in Martha's Vineyard, MA, resulting in greater weight variation of the HSC baits compared to the other baits (Table 1). Anterior and posterior quarters of female HSCs were tested separately as there may be differences in the chemoattractants present in different parts of the animal.

a) ¼ Female Horseshoe Crab – Prosoma (FHSC Prosoma): anterior quarter of female HSC.
b) ¼ Female Horseshoe Crab Opisthosoma (FHSC Opisthosoma): posterior quarter containing the hinge, spines, and telson.
c) ½ Male Horseshoe Crab (Male HSC): lateral half of male HSC.

2) Green crabs (GC): trapped in the Great Bay Estuary, NH and prepared in two ways:

a) Ground GC: whole crab ground to a coarse, homogenous mixture of meat and shell.
b) Whole GC: whole crab crushed to crack the carapace and release attractants.

3) Surf clam bits (CBits): supplied by Trident BioSystems in Hyannis, MA, a seafood processing plant, from their waste stream.
4) GC Mix: ground green crab (Ground GC) mixed with a sodium alginate binder mix to form a solid bait puck and extend shelf life.
5) CBits Mix: surf clam bits mixed with a sodium alginate binder to form a solid bait puck. This mix was tested to determine if the addition of a binder would preserve the bait as fishers report that clams become rancid more quickly than other baits.
6) Poultry Mix: poultry byproduct meal mixed with a sodium alginate binder to form a solid bait and test a negative control terrestrial protein source commonly used in aquafeeds but not expected to be attractive to whelks.
7) Surf Clam: field collected whole surf clam tested as a positive control for a molluscan forage item to measure the attraction of whelks to clams.
8) GC + CBits Mix: ground green crab, clam bits, and sodium alginate binder mixed to test how combining alternative baits affects whelk attraction. In addition, this mix was stored using two separate methods, refrigerated and frozen, to determine how storage impacts the sodium alginate binder and whelk attraction.

a) Refrigerated GC + CBits Mix: stored in the refrigerator until time of use.
b) Frozen GC + CBits Mix: stored in the freezer and thawed 3 hrs prior to use.

9) HSC Blood Mix: male HSC blood obtained from captive *Limulus* at the UNH Jackson Estuarine Lab. Blood was undiluted and mixed with brewer spent grains from the Portsmouth Brewery (NH) and an alginate binder to create a solid bait. The number of dissolved solids in the blood was measured with a Atago 3810 (PAL-1) Digital Pocket Refractometer and had a Brix value of 7.2%.
10) GC + CBits + BSG Mix: mixture of clam bits, ground green crab, brewer spent grains, and a sodium alginate binder.
11) Clam bellies: solid waste from processed surf clams including the stomach, liver, and other organs (Boardman and Flick 1989), supplied by Trident BioSystems in Hyannis, MA. This was tested because this clam waste stream volume is more consistent and would be cheaper than using clam bits in an alternative bait.
12) CBel Mix: clam bellies and sodium alginate binder mix.
13) 60 GC/40 CBel Mix: 60% crushed green crab, 40% clam bellies and sodium alginate binder mix tested to evaluate how combining raw bait and a mixed bait affects whelk attraction.

2.1.4. Data collection and analysis

Brinno camera video footage was downloaded and slowed to 0.25X speed to facilitate analysis. When reviewing the video data, all whelk interactions with the bait bags (either control or baited bags) were recorded. Interaction time was determined by recording the duration of time during which the whelk was in physical contact with the bait bag. Accidental bumping into the bait bag as the whelk moved in circles around the tank was excluded but investigatory and feeding behaviors were considered positive interactions. These included when the whelk: 1) touched the bag with its siphon; 2) touched the bag with its foot; 3) moved the bag with its body/foot; 4) latched onto the bag; and/or 5) pushed the bag around with its body after touching it with its siphon. The time of day when these activities occurred, as well as the duration of each interaction, were recorded.

The results of the 24-hr trials conducted in 2021 and 2022 were analyzed together using R (Version 4.1.1) (R Core Team, 2022). The total interaction time of whelks with each bait and their corresponding controls were compared utilizing a Poisson-lognormal generalized linear mixed model in which bait type, year, temperature, and weight of the bait were considered fixed effects. Tank and whelk were considered random effects. A threshold of 0.05 was used for significance. Residual plots were examined to verify model assumptions.

2.2. 48-Hour laboratory bait trials

To evaluate the attractiveness of an alternative bait over a longer

soak time, thus more closely simulating commercial fishing operations in which soak times can range from one to four days, 48-hour laboratory trials were conducted at the UNH CML from September 10 to December 2, 2021 (Table 2). Based on the results of the 2021 24-hour laboratory trials, the most attractive alternative bait (in terms of highest mean whelk interaction time) at that time, Frozen GC + CBits Mix, was compared to a positive control, 1/4 of a female horseshoe crab (FHSC). The FHSC part used was not denoted for these trials. Trials were conducted and video footage was analyzed in the same manner described for the 24-hour laboratory bait trials except the duration was extended to 48-hours. The results for 48-hour trials total bait interaction were similarly analyzed in R (Version 4.1.1; R Core Team, 2022). Whelk interaction throughout the soak period, or the duration of time during which the whelk was in contact with the bait bag, was analyzed by reviewing individual whelk interactions with the bait bag and marking whelk feeding as present (1) or absent (0) for each hour of the trial (0–48 h). For each hour of the soak period, the proportion of whelk interaction for each bait was calculated for data visualization. Whelk attraction to both baits throughout the soak period was compared using a binomial regression.

3. Results

3.1. 24-Hour trials

Seventeen different baits were tested in a total of 189 trials (Table 1). Channeled whelks interacted with various baits for 0–17.3 h during the 24-hr testing periods. Whelks were in contact with bait bags containing a FHSC Prosoma, the standard whelk bait all other baits were compared to, for an average of 8.4 h (range: 0.4–17.4 h) out of the 24-hour trial (Table 3). Only one alternative bait, the 60 GC/40 CBel Mix, was more attractive to whelks than the FHSC Prosoma (average interaction time of 9.31 ± 0.52 (SEM) hrs (Fig. 2); Poisson lognormal Generalized Linear Mixed Model; $p < 0.05$). Whelks interacted with HSC Blood Mix, Poultry Mix, and GC Mix significantly less than the FHSC Prosoma, whereas the rest of the baits were not significantly different from FHSC Prosoma (Table 3; Fig. 2). The HSC Blood Mix and the Poultry Mix were the only baits that were not significantly different than their respective inert negative controls (t-test; HSC Blood Mix $p > 0.05$, Poultry Mix $p > 0.05$, All Other Baits $p < 0.05$; Table 3) suggesting that they were not attractive at all to whelks.

The amount of bait (83.4–444.2 g) significantly affected the duration whelk spent in contact with the bait bags (Poisson-lognormal Generalized Linear Mixed Model; $p < 0.05$; Table 3). For each 1 g increase in bait within a bait bag, there was a 0.4% increase in the time whelks

Table 3
Summary of 24-hour bait results with the bait, mean time whelks spent interacting with bait bags (standard deviation), t test p-values comparing baits with their respective negative controls, and Poisson log-normal generalized linear mixed model (GLMM) p-values. Poisson GLMM p-values describe whelk interaction with a bait compared to FHSC Prosoma. Significant p-values are indicated by bolded text. The p-values for fixed effects, temperature, bait weight, and year, in the Poisson GLMM are included along with the range of those factors.

Bait	Mean Whelk/Bait Interaction Time (hrs)	Minimum Interaction Time (hrs)	Maximum Interaction Time (hrs)	Bait/Control t test p-value	Poisson GLMM p-value
FHSC Prosoma	8.39 (± 4.60)	0.43	17.38	**7.192e-06**	———
Control FHSC Prosoma	0.10 (± 0.18)	0.00	0.53	———	———
FHSC Opisthosoma	6.05 (± 3.39)	1.63	11.85	**8.711e-06**	0.7137
Control FHSC Opisthosoma	0.12 (± 0.17)	0.00	0.43	———	———
Male HSC	7.33 (± 4.00)	1.50	14.12	**3.657e-08**	0.9322
Control Male HSC	0.19 (± 0.45)	0.00	1.92	———	———
Ground GC	4.60 (± 2.67)	0.58	10.32	**0.003498**	0.3066
Control Ground GC	1.03 (± 3.17)	0.00	12.00	———	———
Whole GC	4.31 (± 2.61)	0.75	7.87	**0.008675**	0.1389
Control Whole GC	0.98 (± 1.33)	0.00	3.05	———	———
Clam Bits	5.42 (± 4.66)	0.45	14.6	**0.0023**	0.2055
Control Clam Bits	0.11 (± 0.24)	0.00	0.87	———	———
GC Mix	3.35 (± 2.57)	0.58	8.72	**0.008224**	**0.0142**
Control GC Mix	0.37 (± 0.54)	0.00	1.60	———	———
CBits Mix	4.12 (± 2.33)	0.80	8.63	**0.001054**	0.0684
Control CBits Mix	0.31 (± 0.50)	0.00	1.42	———	———
Poultry Mix	0.28 (± 0.38)	0.00	1.18	0.5622	**< 2e-16**
Control Poultry Mix	0.48 (± 0.97)	0.00	2.98	———	———
Surf Clam	7.78 (± 2.90)	4.12	12.68	**0.0001301**	0.7553
Control Surf Clam	0.14 (± 0.36)	0.00	1.03	———	———
Refrigerated GC + CBits Mix	6.89 (± 4.78)	0.03	14.32	**0.002752**	0.1981
Control Refrigerated GC + CBits Mix	0.75 (± 1.86)	0.00	6.03	———	———
Frozen GC + CBits Mix	6.19 (± 4.03)	1.07	13.1	**0.0009853**	0.3383
Control Frozen GC + CBits Mix	0.09 (± 0.21)	0.00	0.68	———	———
HSC Blood Mix	0.06 (± 0.06)	0.00	0.17	0.3704	**< 2e-16**
Control HSC Blood Mix	0.14 (± 0.26)	0.00	0.82	———	———
GC + CBits + BSG Mix	5.41 (± 2.41)	2.72	9.32	**0.000158**	0.4510
Control GC + CBits + BSG Mix	0.13 (± 0.30)	0.00	0.93	———	———
Clam Bellies	6.46 (± 4.47)	0.23	15.8	**0.0002934**	0.3189
Control Clam Bellies	0.47 (± 1.33)	0.00	4.25	———	———
CBel Mix	6.62 (± 2.64)	3.63	10.3	**0.0004467**	0.1111
Control CBel Mix	0.07 (± 0.10)	0.00	0.32	———	———
60 GC/40 CBel Mix	9.31 (± 1.66)	7.87	12.1	**2.016e-08**	**0.0214**
Control 60 GC/40 CBel Mix	0.11 (± 0.23)	0.00	0.73	———	———
Poisson GLMM Fixed Effects	**Minimum**		**Maximum**		**Poisson GLMM p-value**
Temperature	11.2 °C		21.0 °C		0.1981
Weight of Bait	83.38 g		444.23 g		**0.0292**
Year of Testing	2021		2022		**< 2e-16**

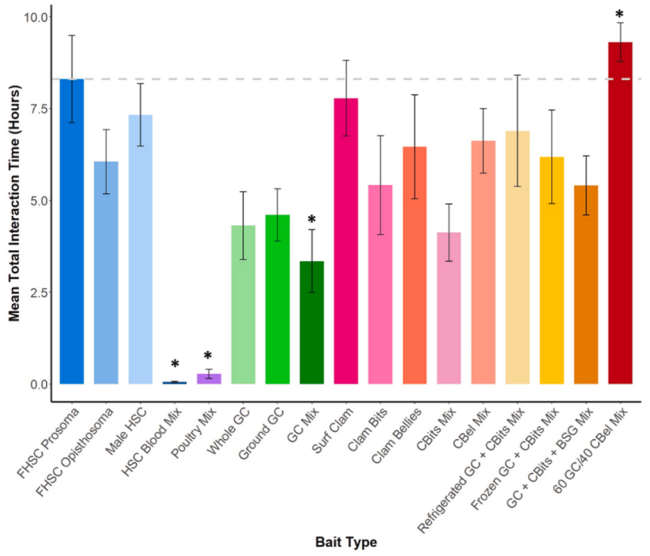


Fig. 2. The mean total time (± 1 standard error) *Busycotypus canaliculatus* spent interacting with horseshoe crab pieces and alternative baits during the 24-hour test period. Asterisks mark baits that were significantly different (Poisson-lognormal Generalized Linear Mixed Model, $p < 0.05$) from female horseshoe crab pieces. Refer to Table 1 for bait descriptions and number of trials conducted per bait type. The dashed gray line indicates the mean FHSC Prosoma interaction time (8.30 h).

spent on the bait bag (Poisson-lognormal Generalized Linear Mixed Model; $p < 0.05$). Temperature during the trials, which ranged from a mean of 12.2–19.8 ℃, did not have a significant effect on whelk interactions with the bait (Poisson-lognormal Generalized Linear Mixed Model; $p > 0.05$; Table 3; Fig. 3). The year bait trials were run significantly affected the amount of time whelks were in contact with the bait bag with a 43% decrease in whelk interaction with bait in 2022 compared to 2021 (Poisson-lognormal Generalized Linear Mixed Model; $p < 0.05$; Table 3).

3.2. 48-Hour trials

No significant difference was observed in the amount of time whelks were in contact with FHSC pieces compared to the Frozen GC + CBits Mix (Binary Regression; $p > 0.05$), but both baits were significantly more attractive than their respective controls (T-test; FHSC $p < 0.001$; Frozen GC + CBits Mix $p < 0.05$). Whelks spent less time interacting with bait bags over the time course of each trial, as indicated by a 7.1% decrease in whelk interactions with each hour the bait was in the water (Binary Regression; $p < 0.001$; Fig. 4). Therefore, despite the duration of the 48-hr trials being twice as long, whelks only interacted approximately 3.2% and 21.9% more with FHSC and the Frozen GC + CBits Mix, respectively, than in the 24-hour trials. This is likely due to leaching of attractants from each of the baits at similar rates as has been seen in other bait trials (Chanes-Miranda and Viana, 2000; Masilan et al., 2022).

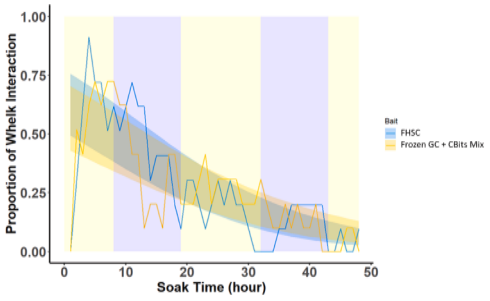


Fig. 4. The proportion of channeled whelk, *Busycotypus canaliculatus*, that interacted with female horseshoe crabs (FHSC) or frozen ground green crab and clam bits mix (Frozen GC + CBits Mix) throughout the 48-hour test period for all bait trials. The light-yellow rectangles represent daylight and blue rectangles represent nighttime hours. The shaded regions of the graph show the standard error for the binary regression. Whelk interaction time between baits over time did not differ significantly, but interaction with each bait dropped over time likely due to bait degradation and leaching of attractants (Binary Regression; $p > 0.05$).

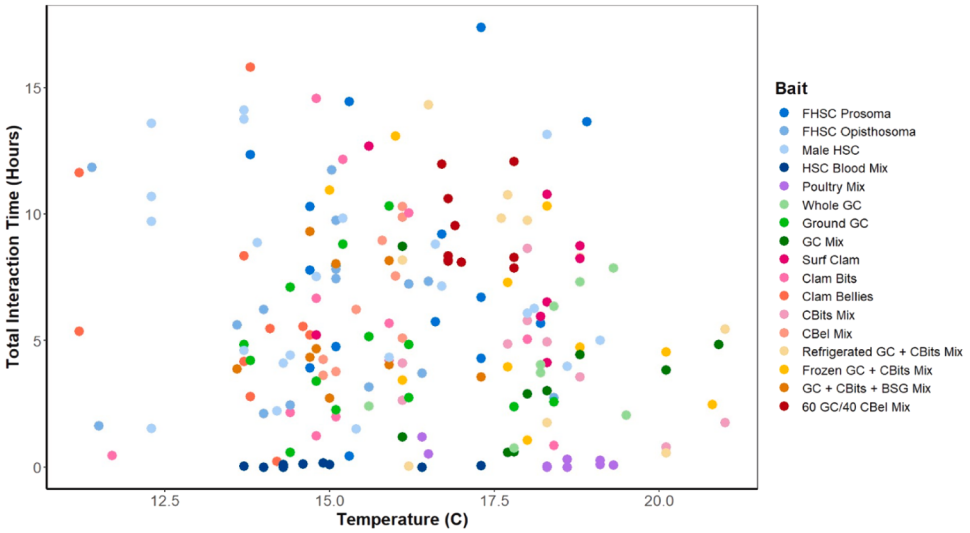


Fig. 3. The relationship between total interaction time of *Busycotypus canaliculatus* with different baits (as described in Table 1) during the 24-hour laboratory trials and temperature (°C). Within the range of temperatures observed in this study whelk interaction with baits increased by 6.0% for each 1 ℃ increase in temperature, however, this trend was not significant (Poisson-lognormal Generalized Linear Mixed Model, $p > 0.05$). Further investigation into the effect of temperature on whelk feeding behavior is required.

4. Discussion

The sex of the HSCs used as bait did not affect whelk interactions with bait bags in our laboratory trials. Whelks did not interact with FHSC Prosoma and FHSC Opisthosoma significantly more than Male HSC pieces. This is an important result as whelk fishers believe more whelks are caught in traps baited with female HSCs (Edmundson, 2021) and it has been proposed that channeled whelks are attracted to a proteinaceous compound in HSC eggs in reproductive females (Ferrari and Targett, 2003). In fact, Ferrari and Targett (2003) suggested that if this peptide could be synthesized in the laboratory, it could be incorporated into an artificial bait that attracts whelks, thus reducing the use of field collected horseshoe crabs (Targett et al., 2009). All female HSCs used in this experiment were collected from Great Bay Estuary (NH) in June of 2021 and 2022 during the spawning season (Schaller et al., 2010; Cheng et al., 2016). Thus, it is likely that most of the female HSCs had eggs in some level of development. Based on these data, the view that a piece of a female HSC is more attractive than a piece of a male HSC might be due to the fact that females are larger. This view is supported by our finding that whelks, overall, were more attractive to bait bags containing more bait, by weight, and some female HSCs used in this study were quite large (Table 1). Studies are currently underway to determine if these laboratory findings translate into catch in the field. If they do, then pressure on FHSC for channeled whelk bait may be reduced without impacting whelk fishing effort.

In the 24-hr trials, channeled whelks were, overall, attracted to both surf clams and green crab-based baits. The combination of green crabs and surf clam bellies (60 GC/40 CBel Mix) was significantly more attractive to whelks than the FHSC, regardless of bait bag weight (Table 3, Fig. 2). In the 48-hr trials, there also was no difference found between whelk interactions with FHSC pieces and one of the alternative green crab-surf clam bait mixes, the Frozen GC + CBits Mix. Furthermore, whelk interaction in both baits decreased at the same rate over time and leveled off after approximately 24-hours (Fig. 3). This suggests that green crab and surf clam bait mixes might provide an effective alternative bait for whelks, or at least that an alternative bait likely exists that can replace HSCs.

Green crabs are a particularly attractive alternative bait ingredient because they are an invasive species and many communities are interested in ways to control them because they cause significant damage to bivalve populations, eelgrass meadows, and marshes (Matheson and Mckenzie, 2014; Neckles, 2015; Aman and Grimes, 2016; Ens et al., 2022). In Massachusetts, green crabs pose a significant threat to bivalve fisheries which, in 2021, had an ex-vessel value of approximately $580 million (Matheson and Mckenzie, 2014; MA DMF, 2022). Green crabs currently are used by some whelk fishers as an ingredient in their bait mixes though their use often is dependent on crab availability, and they are not used as the main attractant. Our findings indicate that if green crab availability increased at a low cost, perhaps through more intensive trapping remediation programs, they could be used as a component of whelk bait. Further, green crabs in a variety of forms (ground, frozen, crushed) can be utilized in whelk bait though we observed the greatest interaction when the crabs were crushed, which also was the most cost-effective.

The terrestrial protein source and negative control, poultry mix, was significantly less attractive to whelks than FHSC Prosoma. HSC blood mix was also significantly less attractive compared to FHSC Prosoma, indicating it is not the part of HSCs that attract whelks. We tested blood because it is a byproduct of the biomedical bleeding process and thus could be a very cost-effective ingredient. The lack of whelk attraction to the combination of male HSC blood, brewer spent grains, and the sodium alginate binder further supports the need for high concentration of marine animal protein in whelk bait.

Surf clam byproducts, such as the clam bits, a processing waste, and clam bellies, which are sold as bait for other fisheries, were as attractive to whelks as whole surf clams suggesting bivalve processing waste streams may make suitable baits. Clam bellies were the most promising bivalve byproduct tested that could be utilized as bait for channeled whelk. Currently, clam bellies are not widely used in the channeled whelk fishery because they have been reported to degrade quickly (Edmundson, 2021). For this reason, we combined clam bellies with a sodium alginate binder to help preserve them longer and reduce their rate of leaching in the water. Based on anecdotal observations during laboratory testing, clam baits mixed with the alginate binder remained more solid after 24-hours compared to unbound clam bits or clam bellies, both of which degraded significantly by the end of the trials, and in the case of the 60 GC/40 CBel Mix, the addition of the alginate binder did not reduce the attractiveness to whelks.

While alginate binder did not appear to influence the attractiveness of bait, it did help maintain the consistency of some of the other ingredients that were mixed with it. However, using the alginate binder also increased the cost of the bait. Since the binders are costly, it will be an important consideration to making alternative baits more affordable by identifying an appropriate binder relative to leach rate.

There were other aspects of this study that should be considered moving forward. Alternative whelk baits were tested in a laboratory setting to reduce external environmental cues that could influence whelk behavior such as tides, temperature change, turbidity, and the odor of natural prey, such as bivalves. In addition, New Hampshire is not within the channeled whelk's natural range which could result in differences between external stimuli found in the laboratory water compared to those in Vineyard Sound (MA) waters where the whelks used in this study were collected. Although temperature has been shown to affect whelk movement, with whelk becoming dormant and catch decreasing in cooler temperatures (Magalhaes, 1948; Edmundson, 2016), little is understood about how daily or seasonal fluctuations in temperature affect whelk feeding behaviors and bait preference. More importantly, the optimal temperature range for feeding of channeled whelks is unknown, although in 24-hr laboratory trials in which whelks interacted with the bait more than 10 h. all feeding occurred between 11.2 and 18.9 °C (Fig. 3). In this study, the range of temperatures observed did not impact channeled whelk interaction with baits (Table 1, Fig. 3).

Throughout the laboratory experiment, whelks were only exposed to one bait at a time, so it is possible that whelks interacted more with baits because they only had one choice. In other words, the choice whelks were given was to eat or not eat, whereas a bait choice experiment in which whelk could select one bait versus another would have provided data on whelk bait preference. While we tried to standardize the weight of all baits tested, the bait weights did vary, and their weights had a significant effect on whelk interaction with the bait bags. However, this is not surprising as we assume that more bait would result in more attractants in the water. Surprisingly, FHSC Prosoma, FHSC Opisthosoma, and Male HSC, on average, weighed more than all alternative baits (Table 1). Yet, overall, whelks interacted with most of the alternative baits as much as they did with the HSC baits.

The year bait trials were conducted affected the amount of time whelks were in contact with baits. This could be attributed to the differences in bait ingredients and recipes that occurred between testing seasons with horseshoe crab baits tested as positive controls both seasons, as well as the duration (Barnwell, 1965) some whelks were in captivity (up to 1.25 years). Therefore, it is possible that the extended time in the laboratory impacted whelk feeding behavior. Altered behavior due to extended time in the laboratory could be why there was decreased activity in 2022 compared to 2021. It is also important to consider that 2021 testing occurred from June to December and in 2022 experiments were carried out from June to August (Table 1). In 2021, whelks were exposed to a broader range of temperatures as baits were tested throughout August and September when waters in New Castle, NH are at their warmest (Table 1). Despite the insignificant effect of temperature in this study, there was a trend of increased whelk feeding in warmer temperatures. More extensive testing is required to better

understand how water temperature and captivity impact whelk feeding behavior. Field experiments evaluating catch per unit effort for traditional versus alternative baits is underway.

5. Conclusions

Whelk attraction to several alternative bait ingredients indicates there is potential for diversifying baits for the channeled whelk fishery. Overall, the use of surf clam wastes and green crabs, together or individually, may be effective replacements for horseshoe crab parts as bait for the channeled whelk fishery. In particular, of the baits tested, whelks interacted the most with a 60% ground green crab/ 40% clam belly mix. Whelks were not attracted to a mix containing poultry byproduct meal, suggesting that future alternative bait research should focus on marine waste streams rather than terrestrial ones. In contrast to previous reports, male HSC pieces were as attractive to whelks as FHSC pieces, indicating that fishing pressure on females can be reduced which should help increase the reproductive output of HSCs in heavily fished regions. Field testing in collaboration with whelk fishers is required to determine whether these laboratory findings translate to catchability in commercial fishing operations. In particular, it will be necessary to validate attraction of legal-size whelks to these baits in the field when there are other foraging choices available to them, and to determine how the handling, costs, and storage of these alternative baits compare to fisher's traditional whelk baits. Ultimately, in order for any alternative bait to be implemented in the whelk fishery, bait cost and whelk catch efficacy will be the determining factors.

CRediT authorship contribution statement

Mary Kate Munley: Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Data Curation, Writing – Original Draft, Visualization; **Elizabeth A. Fairchild**: Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Data Curation, Resources, Writing – Review & Editing, Supervision, Project Administration, Funding Acquisition; **Steven H. Jury**: Conceptualization, Methodology, Validation, Resources, Writing – Review & Editing; **Winsor H. Watson III**: Conceptualization, Methodology, Validation, Resources, Writing – Review & Editing; **Shelley A. Edmundson**: Conceptualization, Methodology, Validation, Resources, Writing – Review & Editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Exhibit S

The Commonwealth of Massachusetts
Division of Marine Fisheries
(617) 626-1520 | mass.gov/MarineFisheries

Maura T. Healey, ***Governor*** | Kimberly Driscoll, ***Lt. Governor*** | Rebecca L. Tepper, ***Secretary*** | Thomas K. O'Shea, ***Commissioner*** | Daniel J. McKiernan, ***Director***

March 3, 2026

Ann Brown
Open Government Coordinator
Center for Biological Diversity
P.O. Box 11374
Portland, OR 97211-0374

February 10, 2026 Public Records Request

Ms. Brown,

The Massachusetts Division of Marine Fisheries (DMF) is in possession of your February 10, 2026 Public Record Request. This request was forwarded to DMF by the Department of Fish and Game's Records Access Officer as the records you seek are maintained by DMF. After a reasonable search DMF has located the responsive records which are accessible through Sharepoint. Please download the records within 10-business days to ensure your continued access to them.

There are five aspects to your request. Below find DMF's response to each of the five aspects.

1. With regards to permits and permitting records, DMF is providing: (1) a list of horseshoe crab bait and biomedical permits issued in 2024 and 2025; (2) the Letters of Authorization and Statements of Permit Conditions issued to biomedical harvester permit holders enabling participation in the biomedical trawl fishery in 2024 and 2025; (3) the propagation permit for horseshoe crab aquaculture issued in 2024 and 2025; and (4) scientific collection permits. No other permits were issued authorizing the collection of horseshoe crabs in 2024 and 2005. DMF is withholding: (1) all data and reports relevant to the number of crabs collected, bled or killed; (2) all data and reports relevant to the number of crabs to in-state or out-of-state biomedical labs by permit holders; and (3) all reports of horseshoe crabs transferred to Massachusetts from Rhode Island. These records are being withheld under the statutory exemption to the Massachusetts public records law at G.L. c. 4, §7(26)(a). These data are held strictly confidential by the Division of Marine Fisheries under G.L. c. 130, §21 and may only be released in aggregate when the disclosure does not "directly or indirectly disclose the identity or business of any person who submits the statistics." On the scientific collection permits, the date of birth for the applicant has been redacted consistent with the privacy exemption to the Massachusetts Public Records Law at G.L. c. 4, §7(26)(c).

   Additionally, in response to the first aspect of your public records request, DMF is providing the annual compliance report sent to the Atlantic States Marine Fisheries Commission for 2024. The 2025 compliance report will not be available until later this year. Certain data within the 2024 report has been redacted consistent with the statutory exemption to the

Massachusetts public records law at G.L. c. 4, §7(26)(a). These data are held strictly confidential by the Division of Marine Fisheries under G.L. c. 130, §21 and may only be released in aggregate when the disclosure does not "directly or indirectly disclose the identity or business of any person who submits the statistics."

2. DMF is providing you with: (1) all relevant memoranda, presentations, and notices that document horseshoe crab survey results and horseshoe crab bait quota monitoring in 2024 and 2025; (2) annual commercial bait fishery monitoring reports for 2024 and 2025; and (3) the presentations from the 2024 and 2025 Horseshoe Crab Science Meetings. Records from the 2026 Horseshoe Crab Science Meeting do not yet exist, this meeting is scheduled for March 20, 2026. DMF is withholding all biomedical fishery monitoring records and reports for 2024 and 2025 consistent with the statutory exemption to the Massachusetts public records law at G.L. c. 4, §7(26)(a). These data are held strictly confidential by the Division of Marine Fisheries under G.L. c. 130, §21 and may only be released in aggregate when the disclosure does not "directly or indirectly disclose the identity or business of any person who submits the statistics."

3. DMF is providing you with all relevant requested communications from January 1, 2025 to February 10 regarding horseshoe crab quota management between listed DMF staff and the Associates of Cape Cod, Charles River Laboratories, and Smith, Costello, and Crawford Public Policy Group.

4. There are no responsive records documenting consultations and communications between DMF and the Natural Heritage Endangered Species Program between January 1, 2025 and February 10, 2025 regarding Director McKiernan's December 12, 2025 memorandum.

5. There are no responsive records regarding the Massachusetts Environmental Policy Act (MEPA) and the regulations proposed for public hearing in Director McKiernan's December 12, 2025 memorandum.

If you believe DMF has not responded to your request in accordance with Massachusetts Public Records Law, you may appeal DMF's response to the Supervisor of Public Records within the Office of the Secretary of the Commonwealth. Any such appeal must be made in writing within ninety days and comply with the requirements of 950 CMR 32.08(1). Please see G.L. c. 66 §10A and 950 CMR 32.08 as to your appeal rights relative to DMF's denial of access to certain confidential records. You may also file a civil action in accordance with G.L. c. 66, §10A.

Sincerely,



Jared A. Silva, Records Coordinator
Massachusetts Division of Marine Fisheries
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