MARINE FISHERIES ADVISORY COMMISSION
BUSINESS MEETING AGENDA
8:30 AM
Monday, February 13, 2023
Via Zoom
Login: https://bit.ly/3DKRTB1
Call In: 1-312-626-6799
Webinar ID: 895-1701-5195
Passcode: 629988

1. Introductions, Announcements and Review of February Agenda (8:30 – 8:35)
2. Review and Approval of December 2022 Business Meeting Minutes (8:35 – 8:45)
3. Comments (8:45 – 9:15)
    a. Chairman
    b. Commissioner
    c. Law Enforcement
    d. Director
4. Upcoming Public Hearing Proposals (9:15 – 10:45)
    a. Commercial Summer Flounder Limits
    b. Commercial and Biomedical Horseshoe Crab Management
    c. Commercial Menhaden Management
    d. Accommodating Federal Maximum Retention and Electronic Monitoring Program
5. Discussion Items (10:45 – 11:45)
    a. Interstate Fisheries Management Update
        i. Winter ASMFC Meeting Summary
        ii. Forecasting Emergency Rule Making for Recreational Scup and Black Sea Bass
    b. Federal Fisheries Management Update
    c. Protected Species Management Update
    d. Public Petitions
        i. Dartmouth Saltwater Anglers on Fish Pots and Tautog
        ii. Request to Start Commercial Striped Bass Season Earlier
6. Other Business (11:45 – 12:00)
    a. Commission Member Comments
    b. Public Comment
7. Adjourn (12:00)

Future Meeting Dates

8:30 AM
March 21, 2023
via Zoom

9:30 AM
April 11, 2023
DFW Field HQ
1 Rabbit Hill Road
Westborough, MA 01581

10:00 AM
May 16, 2023
Emergency Services Bldg
215 Spring Street
Tisbury, MA 02568

All times provided are approximate and the meeting agenda is subject to change. The MFAC may amend the agenda at the start of the business meeting.

MARINE FISHERIES ADVISORY COMMISSION
December 20, 2022
Via Zoom

In attendance:
Marine Fisheries Advisory Commission: Raymond Kane, Chairman; Michael Pierdinock, Vice-Chairman; Kalil Boghdan; Shelley Edmundson; Bill Amaru; Arthur "Sooky" Sawyer; Bill Doyle; Lou Williams; and Tim Brady

Division of Marine Fisheries: Daniel McKiernan, Director; Mike Armstrong, Deputy Director; Bob Glenn, Deputy Director; Kevin Creighton, Assistant Director; Story Reed, Assistant Director; Jared Silva; Julia Kaplan; Nichola Meserve; Melanie Griffin; Kelly Whitmore; Jeff Kennedy; Derek Perry; Steve Wilcox; and Alex Boeri

Massachusetts Environmental Police: Lt. Col. Pat Moran; and Major Chris Baker

Members of the Public: Mark Plachowicz, Maureen Ward, Jamie Bassett, Sharl Heller, Phil Coates, Carol Amato, Francis M, Lizzie Roche, Beth Casoni, Matthew Belson, Deborah Cramer, and Mark.

INTRODUCTIONS AND ANNOUNCEMENTS

Chairman Ray Kane called the December 20, 2022 Marine Fisheries Advisory Commission (MFAC) business meeting to order.

REVIEW OF DECEMBER 20, 2022 BUSINESS MEETING AGENDA

No changes to the agenda were requested.

REVIEW AND APPROVAL OF NOVEMBER 22, 2022 DRAFT BUSINESS MEETING MINUTES

Mike Pierdinock stated asked DMF to amend the minutes to add 'properly permitted' to one of his statements. He also stated he sent Jared Silva some additional minor typographical changes.

Chairman Kane asked for a motion to approve the amended November 22, 2022 draft business meeting minutes. **Shelley Edmundson made the motion to approve the amended November 22, 2022 business meeting minutes. Tim Brady seconded the motion. A roll call vote was taken and the motion passed unanimously 7-0 with Chairman Kane abstaining and Bill Doyle absent at roll call (late arrival).**

CHAIRMAN'S COMMENTS

Chairman Ray Kane thanked everyone for their attendance and commenced the meeting.

COMMISSIONER'S COMMENTS

Commissioner Ron Amidon was not in attendance.

LAW ENFORCEMENT COMMENTS

Lt. Col. Pat Moran stated the Massachusetts Environmental Police (MEP) did not have anything to report at the time.

DIRECTOR'S COMMENTS

Director Dan McKiernan started his comments by highlighting recent scoping meetings to discuss commercial summer flounder and horseshoe crab management. He then moved on to discuss how DMF's Port Profile Project has proven valuable for several municipalities.

DMF's Seafood Marketing Committee met on December 19, 2022. The main topic of discussion was the "red-listing" of American lobster by the Monterrey Bay Aquarium due to concerns about right whale entanglements. The Committee requested DMF highlight the efforts the government and industry have taken to significantly reduce entanglement risks. Dan welcomed any questions from the Commission.

Sooky Sawyer asked about the status of a letter of support from Governor Baker advocating to NOAA Fisheries that Massachusetts' commercial trap fisheries be credited for the Massachusetts Restricted Area in the development of new amendments to the Atlantic Large Whale Take Reduction Plan (ALWTRP). Director McKiernan noted there was emerging development relevant to this and ongoing ALWTRP rule making that DMF would discuss in more detail during the Protected Species Update.

Chairman Raymond Kane asked if Fish Day at the State House will be occurring in the coming months. He thought it represented a great opportunity to expose people to underutilized fish species and raise awareness about Massachusetts' seafood industry. Dan stated that he will look into the 2023 state house schedule and see if anything is on the calendar.

ACTION ITEMS

Period I Summer Flounder In-Season Adjustment and Trip Limit Increase

Director McKiernan recommended increasing the summer flounder commercial possession limit for the 2023 Period I (January 1–April 23) fishery from 3,000 pounds to 10,000 pound to allow the fleet to continue fishing at the elevated limits adopted for the October 1 – December 31 fishery in 2022. He then went on to explain the rationale behind the recommendation, which included improving the utilization of annual quota, setting 2023 Period I limits commensurate with current limits, and incentivizing vessels

fishing offshore during the winter to target summer flounder and land this product in Massachusetts.

Jared Silva added the Period I fishery has not taking its full quota allocation (30% overall) during the offshore wintertime fishery in recent years. Given the 1.39-million-pound quota for 2022, the Period I allocation was approximately 418,000 pounds. With a 2,500-pound trip limit in 2022, the Period I fishery landed approximately 214,516 pounds, just over 50% of its quota allocation. Jared also highlighted a low price per pound, as well as other economic factors, reportedly affected fishing effort.

Sooky Sawyer asked about summer flounder landings in state waters. Jared explained that the winter fishery occurs offshore in federal waters, whereas during the summertime fishery occurs primarily in state waters. Summertime fishery participants, specifically inshore draggers, have long preferred low trip limits to the benefit of the dayboat fishery. However, this makes it unprofitable to target fish in the federal zone. There was further discussion among Chairman Kane and DMF staff regarding historical summer flounder quota and factors that influence landings.

Bill Amaru expressed concerns regarding the infrastructure supporting the summertime inshore trawl fishery. He also stated environmental issues have contributed to decreasing effort, specifically the substantial presence of algae in the Sounds, making it more difficult to fish with trawl gear.

Mike Pierdinock agreed with Bill's comments and added that marine fuel costs are a major economic factor for all fishery participants.

Chairman Kane asked for a motion to approve the recommendation from the Director. **Bill Amaru made a motion to approve the recommendation. Sooky Sawyer seconded the motion. The motion was passed unanimously 8-0, with Chairman Kane abstaining.**

<u>Letters from MFAC to Incoming and Outgoing Administrations</u>
Director McKiernan stated the MFAC was asked to prepare correspondence to the incoming and outgoing administrations and drafts were included in this month's meeting materials. The letter to Governor Baker thanks his outgoing administration for their work on important fisheries management issues; the letter to Governor-Elect Healey welcomes the new administration and invites their cooperation on the various challenges facing the Commonwealth's fisheries and seafood industry.

Chairman Kane asked if there were any edits. No comments were made. He then asked if there were any objections to the MFAC sending these letters; no objections were raised.

Jared Silva indicated he would work with the Commissioner's office to distribute these letters to the outgoing and incoming administrations.

DISCUSSION ITEMS

Federal Fisheries Management Update

Melanie Griffin, briefed the MFAC on the happenings at the December 5 – December 8 New England Fishery Management Council (NEFMC) meeting in Newport, RI; provided a preview of the January 24 – January 26 NEFMC meeting in Portsmouth, NH; and addressed other relevant business.

At the December NEFMC meeting, Framework 65 to the Multi-Species Fishery Management Plan (FMP) was approved. This addressed the rebuilding plan for Gulf of Maine (GOM) cod, set 2023-2024/2025 specifications for regulated species, and dealt with the Georges Bank cod recreational catch target. The framework did not include revisions to the Annual Biological Catch rule or additional measures to support GOM cod rebuilding. The Council also approved Framework 36 to the Atlantic Sea Scallop FMP. This framework set scallop access area and open bottom fishery specifications for the Limited Access and Limited Access General Category fleets in the Northern Gulf of Maine (NGOM), Georges Bank and the Mid-Atlantic, It also set the 2023 total allowable catch for the NGOM management area; authorized two 12,000 pound access trips to Area II (Eastern Georges Bank); and set days-at-sea. DMF also reviewed the 2023 spiny dogfish quota; delays in Framework 13 to the Monkfish FMP; and actions to retain dedicated habitat research areas in Stellwagen Bank and Georges Bank.

The preliminary agenda for the January meeting has the Council addressing recreational groundfish management measures and a possible control date form the NGOM sea scallop fishery.

As for other business, DMF staff discussed NEFMC management priorities for 2023; the federal sea herring industry disaster aid package; portside sampling; and offshore wind energy development. Staff pledged to follow-up directly with Commission member interested in the monkfish discard calculation methodology and the breakdown of Georges Bank cod quota.

Interstate Fisheries Management Update

Nichola Meserve reviewed the outcomes from the December 13 joint meeting of the Mid-Atlantic Council and ASMFC's Summer Flounder, Scup, and Black Sea Bass Management Board. The focus of this week was to set the 2023 recreational specifications for the three species.

Nichola described how the 2023 recreational harvest limits (RHLs) and subsequent development of recreational fishing limits were being influenced by a variety of factors. This included: new allocations between the recreational and commercial sectors; RHL overages in 2022 for scup and black sea bass; a new model to project future years' harvest at certain bag limit, season, and size limit combinations that incorporates variables like year class strength and angler preferences; and the use of the so-called "percent change approach" adopted as part of the new harvest control rule.

The management outcomes were as follows: status quo recreational management for summer flounder and 10% harvest reduction for scup and black sea bass. Nichola explained how the reductions for scup and black sea bass would have been greater if the percent change approach was not used.

For scup, the decisions included a change to the federal waters measures, including a January 1 – April 30 closure and a 10-fish reduction in the bag limit. States from New Jersey south, which contribute minimally to coastwide harvest (~5%), are expected to implement a May–December open season, 40 fish per angler bag limit, and 10" minimum size. A number of options were being considered for the Northern Region (New York to Massachusetts) to achieve the 10% harvest reduction. Nichola anticipated substantial adjustments to the fishing limits may be needed, given models show a reducing the bag limit to 15 fish only achieves a 4% harvest reduction.

For black sea bass, the Northern Region (New York to Massachusetts) are not required to have uniform measures across state. However, the states are working together to develop an equitable approach given the varying rules across jurisdictions. Nichola hoped that Massachusetts reduction in black sea bass recreational harvest in 2022 and already conservative measures would assist in minimizing the impact to the state's anglers and for-hire businesses.

Nichola then discussed the next steps in the management process. Technical Committee meetings will be held in January to establish guidelines and the methodology for the states/regions to use in developing proposals for scup and black sea bass. More clarity is still needed on the timeline for management board approval of state/region proposals, and what opportunity there will be for states to collect public input. However, Nichola was optimistic DMF would be able to conduct a scoping meeting and comment period during the late winter and prior to proceeding to emergency rule making to implement conforming regulations for the start of the recreational fishing season.

Nichola closed her comments with two additional public scoping and comment reminders relevant to ASMFC managed species. Striped Bass Draft Addendum I, which considers allowing transfers of coastal commercial quota, is currently open for public comment with a written comment deadline of January 13; MA's virtual public hearing occurred on December 19. Additionally, DMF announced the date for its second commercial menhaden management scoping meeting—January 13 at the Gloucester field office.

Mike Pierdinock asked when the public meetings for scup and black sea bass would likely occur. Nichola stated in years past these scoping meetings were held in late-February. However, given the new process for 2023, she anticipated the meetings may be delayed a few weeks.

Mike P. stated his support for maintain status quo management for both scup and black sea bass, if at all possible. Nichola reiterated that the coastwide implication was a 10%

reduction for both species and she did not expect status quo would be possible for Massachusetts.

Mike P. then asked what Nichola anticipated the recreational fishing limits would be. She stated that DMF had not yet run models but would do so in advance of public scoping meetings this winter. There was further discussion between Mike and Nichola regarding PSEs and how they are considered in the development of these regulations.

Kalil Boghdan commended DMF and ASMFC for the way they ran the Massachusetts public hearing on Striped Bass Draft Addendum I.

Protected Species Management Update

Director McKiernan and Bob Glenn provided the MFAC with a protected species update. Bob began his comments with a high-level overview of the deliberations at the recent Atlantic Large Whale Take Reduction Team (ALWTRT) meeting. He then discussed the 2023 federal omnibus spending bill, which contains language to delay the December 31, 2024 deadline for new ALWTRP rule-making affecting lobster and Jonah crab trap fisheries until December 31, 2028. The bill also contains language to support funding for enhanced right whale monitoring efforts, research into whale safe gear technologies, and potential modifications to the Decision Support Tool used to model entanglement risk. Dan and Bob stated that if the proposed bill passes, it would end current ALWTRP rule making efforts affecting the lobster and Jonah crab trap fishery and provide NOAA Fisheries more time to come up with a risk reduction plan. It would not impact pending rule making for other trap fisheries and gillnets. Lastly, Bob added DMF had completed its ITP application and was preparing to submit it to NOAA Fisheries.

Recent Stakeholder Meetings on Horseshoe Crabs and Summer Flounder

On December 13, 2022, DMF held stakeholder scoping meetings on the management of the commercial summer flounder and horseshoe crab fisheries. Jared Silva gave a high-level overview of each meeting. In summary, the summer flounder discussion focused on recent fishery performance and how best to improve utilization of quota at current elevated level. The horseshoe crab meeting focused on changing dynamics of the fishery due to increasing demand from the biomedical fishery in Massachusetts and increasing concerns from the conservation community.

Jared mentioned that the presentations used in each meeting were included in this month's MFAC meeting materials. He then summarized the type of feedback and requests DMF received on each issue.

Summer Flounder

- Analyze potential for decreasing net mesh size from 6.5" (current state-wide standard) to 5.5" for the inshore trawl fishery in the Sounds (minimum size allowed by FMP for directed summer flounder fishing).
- Consider increases to trip summertime trip limits for all gear types, particularly during late-spring and early-summer when price is elevated.

- Potential for an RI-style aggregate weekly landing program involving daily EVTR and vessel tracking.
- Address concerns about need to enhance access to this fishery while balancing concerns raised by commercial fishers regarding permit equity and capital investments.
- Consider status quo management for 2023 given upcoming stock assessment and potential quota adjustments in 2024.
- Reconsider P1 and P2 allocations if quota remains elevated moving forward.
- Liberalize or eliminate the 8PM to 6AM landing prohibition.

Bait Horseshoe Crab Fishery

- Raise the current trip limit for trawlers (300 crabs) to make bait fishery more economically competitive with biomedical fishery.
- Increase access to bait fishery among active trawlers.
- Eliminate lunar closures for mobile gear fleet.
- Demand for bait remains strong despite decreasing effort in Massachusetts' whelk pot fishery.

Biomedical Horseshoe Crab Fishery

- Interest in maintaining current trip limits (1,000 crabs).
- Concerns regarding mortality during harvest, handling, and penning.
- New BMPs being developed at ASMFC focused on harvest and handling.
- Ability to participate in summer flounder aggregate program if also participating in biomedical horseshoe crab fishery.
- Increase participation in rent-a-crab program.
- Improve science on biomedical mortality and the sub-lethal impacts biomedical processing, particularly on spawning.

Horseshoe Crab Conservation

- Increase spawning protections for all participants.
- Close harvest in Wellfleet Harbor.
- Eliminate bait fishery and phase out biomedical fishery.
- Improve metrics for measuring abundance
- Conduct egg density studies on beaches.

Sooky Sawyer noted he spoke with participants in the inshore trawl fleet and heard their concerns regarding their inability to land and offload fish prior to 8PM. Jared mentioned DMF intended to review the nighttime land prohibition. Jared added a weekly aggregate pilot program could also relieve some of the issues related to offload by allowing for dealers and fishers to better stagger offloading over the course of week.

Mike Pierdinock commended DMF for finding ways to utilize the available quota. Mike P. then asked about the additional bycatch that may result from a net mesh size

decrease. Jared stated DMF would review this issue when developing a public hearing proposal.

Mike P. also asked if this inshore trawl fleet was required to come to port once they reached one of their limits or if they could continue to fish and discard species they were already limited out on. Jared stated DMF did not require vessels halt fishing operations and land their catch once they limit out one species. Rather, DMF attempted to set trip limits that would minimize the potential for regulatory discarding on a daily basis and over the course of a season (by using trip limits to manage quota use).

Bill Amaru stated he could potentially support the idea of a weekly aggregate program and mentioned there needs to be a way for newer, younger fishers to gain access to the fishery.

Sooky Sawyer asked about the biomedical bleeding mortality. Bob Glenn stated there are a number of studies that attempt to estimate biomedical bleeding mortality and the study results are variable. The ASMFC uses a 15% figure in their stock assessment.

Sooky then asked if DMF anticipated other biomedical firms would move into Massachusetts. Bob and Dan were not aware of new companies looking to set up businesses in Massachusetts. For many years, Associates of Cape Cod was the sole biomedical processor in the state. However, in 2021, DMF did not anticipate Charles River Labs entering the biomedical fishery in 2022.

Bill Amaru noted the biomedical fishery was using a variety of techniques to properly handle horseshoe crabs and he felt mortality was likely less than 10%. He asked DMF to consider implementing a research program to further investigate this question.

In conclusion, Jared Silva DMF would develop public hearing proposals to be submitted for the MFAC's review at a winter business meeting with the goal of proceeding to public hearing and comment this spring allowing DMF to amend regulations for the start of the inshore fishing season in May.

OTHER BUSINESS

Commission Member Comments
Mike Pierdinock, Kalil Boghdan, Bill Amaru, Shelley Edmundson, Bill Doyle, Lou Williams and Sooky Sawyer wished everyone happy holidays.

Chairman Kane commended the Commission members for their attendance and involvement on the Commission. He closed his comments by wishing everyone happy holidays.

PUBLIC COMMENTS

Sharl Heller commended Dan McKiernan for running a great horseshoe crab stakeholder meeting on December 13 and Jared Silva for accurately capturing comments from the conservation community at today's meeting. She then emphasized the ecological and cultural importance of the horseshoe crab resource and the need for additional conservation.

Beth Casoni thanked Bob Glenn for his efforts at recent ALWTRT meetings. Beth then asked about the timeline for NOAA Fisheries review of DMF's Incidental Take Permit application; DMF has not yet submitted this application and was not able to project the timing of the federal review process. Lastly, Beth added that she was appointed to the American Fisheries Advisory Committee, which oversees the Staltonstall-Kennedy Grant monies and she attended her first meeting last week in Seattle.

Phil Coates asked about when the summer flounder management amendments would take effect. Jared Silva stated DMF aimed to hold public hearings this winter for implementation in May 2023. Phil then wished everyone happy holidays.

ADJOURNMENT

Chairman Ray Kane requested a motion to adjourn the December MFAC business meeting. **Sooky Sawyer made a motion to adjourn the meeting. The motion was seconded by Shelley Edmundson. The motion was approved by unanimous consent.**

MEETING DOCUMENTS

- December 2022 MFAC Agenda
- November 2022 Draft MFAC Meeting Minutes
- Recommendation to Increase Period I Summer Flounder Trip Limits
- MFAC Letter to Baker Administration
- MFAC Letter to Healey Administration
- Presentation on NEFMC Update
- Presentation on Joint ASMFC-MAFMC Meeting
- DMF Presentation on Recent Stakeholder Scoping Meetings
- Horseshoe Crab Stakeholder Meeting Presentation
- Summer Flounder Stakeholder Meeting Presentation

UPCOMING MEETINGS

8:30 AM
February 13, 2023
via Zoom

8:30AM
March 21, 2023
via Zoom

9:30AM
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DFW Field HQ
1 Rabbit Hill Road
Westborough, MA 01581

10:00AM
May 16, 2023
Emergency Services Building
215 Spring Street
Tisbury, MA 02568

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MAURA HEALEY, Governor | KIMBERLEY DRISCOLL, Lt. Governor | REBECCA TEPPER, Secretary | RONALD S. AMIDON, Commissioner | DANIEL J. MCKIERNAN, Director

MEMORANDUM

TO: Marine Fisheries Advisory Commission (MFAC)

FROM: Daniel J. McKiernan, Director

DATE: February 8, 2023

SUBJECT: **Proposal to Adjust Commercial Summer Flounder Limits for 2023**

Proposal

Given recent fishery performance, and that the 2023 commercial summer flounder quota will remain elevated at 1.36 million pounds, I am proposing several potential adjustments to the management of the commercial fishery beginning in 2023. These proposals are informed by public comment received at an industry scoping meeting on December 13, 2023. These proposals focus on increasing access to the quota and enhancing the efficiency of the fishery to the benefit of its remaining participants.

1. Adjust the so-called landing window, so that vessels may offload summer flounder from 6AM to 10PM, rather than 6AM to 8PM.
2. For summertime Period II fishery (April 23–September 30), either:
    a. adopt a weekly aggregate pilot program for trawlers exempting them from daily limits in favor of a weekly limit, or.
    b. increase the trip limit for trawlers from 500 pounds to 800 pounds with a scheduled increase to 1,000 pounds on September 1 (rather than 800 pounds) if more than 20% of the quota remains
3. Adjust the bycatch allowance provision for the small mesh squid fishery. Rather than setting at 100-pound limit for summer flounder when fishing for small mesh or when in possession of more than 250 pounds of squid, have this limit only apply when fishing with small mesh.
4. For the fall Period II fishery (October 1–December 31), increase the trip limit from 3,000 pounds when more than 5% quota remains and 800 pounds otherwise to 10,000 pounds when more than 5% of the quota remains and 1.000 pounds otherwise.
5. For Period I (January 1 – April 22), increase the regulatorily set limit from 3,000 pounds to 10,000 pounds.

The above-described potential adjustments to trip limits by season are depicted in Table 1.

Background

Massachusetts' annual summer flounder quota has been rising since its all-time low in 2017 (Table 2). In recent years (2021 and 2022), the growth in the quota has been substantial in response to increases to the coastwide quota as based on the results of the most recent stock assessments[1] and a change in how the

[1] For example, the 2021 stock assessment (used to set 2022 specifications) demonstrates summer flounder are not overfished and overfishing is not occurring. Spawning stock biomass was estimated to be 86% of the target and trending upwards, while fishing mortality was estimated to be 19% below the threshold.

coastwide quota is allocated among the states resulting in a heightened share for Massachusetts[2]. For 2022, Massachusetts quota was set at 1.39 million pounds—the highest level it has been in more than a decade—and for 2023, the quota will remain similarly elevated at about 1.36 million pounds.

Table 1. Proposed Changes to Trip Limits by Season

Period	Quota Allocation	Season	Trip Limit*	Size Limit
Period I	30%	January 1 – April 22	**10,000 pounds** ~~**3,000 pounds**~~ 100 pounds once 30% of quota taken	14”
Period II	70%	April 23 – August 31*	**800 pounds** ~~**500 pounds**~~	14”
		September 1 – September 30	**1,000 pounds** ~~**800 pounds**~~ **if >20% quota;** **800 pounds** ~~**500 pounds**~~ **if <20% quota**	
		October 1 – December 31	**10,000 pounds** ~~**3,000 pounds**~~ **if >5% quota;** **1,000 pounds** ~~**800 pounds**~~ **if <5% quota**	
		Small-mesh squid fishery allowance	100 pounds if fishing with small mesh ~~**or in possession of > 250 pounds of squid**~~.	

* DMF, with the approval of the MFAC may make temporary in-season adjustments to trip limits based on anticipated fishery performance and quota utilization. For instance, for the October 1 – December 31 season in 2022 and Period I in 2023, DMF increased the trip limit to 10,000 pounds.

Table 2. Massachusetts Annual Quota and Landings (2017 – 2023)

Year	Quota (lb)*	Landings (lb)	Percent Utilized
2017	389,573	419,714	108%
2018	413,361	427,167	103%
2019	741,532	551,267	74%
2020	795,584	700,390	88%
2021	1,025,159	679,914	66%
2022	1,391,379	872,386	63%
2023	1,358,834	65,320**	5% (YTD)

* Quotas are adjusted by transfers.
** Landings for 2023 current as February 2, 2023

DMF held a series of industry meetings over the past few years to discuss how to adjust the state’s summer flounder management program in response to this increased quota availability. A product of these industry meetings was a series of regulatory amendments enacted this past May to liberalize the commercial summer flounder limits[3]. While these regulatory amendments did enhance landings in 2022 compared to recent years (Table 2; Figure 1), we underutilized the annual quota by more than 35%

[2] Beginning in 2021, when the coastwide quota exceeds 9.55 mlb, all additional quota above this level is allocated in equal shares of 12.375% to all states (except ME, NH, and DE which share 1% of the additional quota). Quota up to 9.55 mlb is allocated under the historic shares based on 1980-1989 landings. Massachusetts’ historic baseline quota share is 6.82%. Based on the size of the coastwide quota, the state’s quota share was effectively increased to roughly 8.1% for 2021 and 8.9% for 2022–2023.

[3] https://www.mass.gov/doc/042922-new-regulations-affecting-commercial-summer-flounder/download

(~500,000 pounds). We would expect similar performance and quota utilization in 2023 under status quo management. To address this expected underutilization, DMF held an industry scoping meeting on December 13, 2022 at SMAST East to hear from constituents on what potential changes should be considered moving forward. The meeting was well attended with commercial fishers and seafood dealers providing DMF with input on the management of the fishery. Several competing ideas were discussed.

There exists a segment of commercial fishers who wanted to retain status quo regulations for 2023, allow the fishery to likely underperform the quota again, and then revisit management next winter with the benefit of an updated stock assessment. They expressed concerns that substantial changes to the summertime limits could negatively impact the viability of the inshore dayboat fishery by increasing fishing effort in Vineyard and Nantucket Sounds and reducing local availability, which would disproportionately impact small boat fishers who cannot lawfully or safely access federal waters. Further, they argued it was short-sighted to make sweeping management changes this year when the available quota could be reduced in 2024 in response to the stock assessment. There exists a sentiment that the current stock assessment exaggerates stock abundance producing inflated quotas and this may be corrected with the benefit of a new assessment.

However, this was not the prevailing sentiment. Both dealers and commercial fishers supported DMF efforts to make the summertime fishery more effective, efficient, and profitable. This included accommodating higher trip limits earlier in the season when the price is strong; expanding or eliminating the landing window to allow for more flexibility to offload boats given seasonal summertime day length, the availability of trucks and traffic on Cape Cod during the summer; and adopting a weekly aggregate program to increase the fleet's efficiency. These comments strongly influenced the development of DMF's public hearing proposal.

The dealer sector also strongly advocated for the state to utilize the available quota and these sentiments are echoed in the attached letters from Red's Best regarding the importance of utilizing available quotas to the state's seafood production sector.

There were also other requests from industry that are not included in this public hearing proposal. Some commercial fishers supported lifting the prohibition on night fishing. Proponents argued this would allow them to fish harder for summer flounder to utilize the quota and to better access scup and horseshoe crabs, which are purportedly caught in greater quantities during pre-dawn tows. Others supported dropping the minimum mesh size for the summer flounder trawl fishery from 6.5" in the cod end to 5.5" in the cod end. This is the minimum net mesh size for summer flounder established by the interstate and federal fishery management plans and adopting a smaller net mesh size could increase access to legal sized summer flounder.

I do not support accommodating night fishing at this time. Night fishing was historically prohibited to prevent gear conflicts with fixed gear and aid in fisheries enforcement. These remain management concerns. There is fish pot and whelk pot fishing effort occurring in Nantucket and Vineyard Sounds during the summer and early fall period and allowing night fishing would expose these fisheries to potential gear conflicts. It could also incentivize unlawful fishing in closed areas. I think the marginal benefit potentially provided by lifting the night closures is far outweighed by the potential challenges related to gear conflicts, enforcement, and compliance.

I also do not support accommodating the requested net size reduction at this time. This is a mixed trawl fishery that catches summer flounder along with horseshoe crabs, black sea bass, whelks, and scup. Reducing the net mesh size will likely alter the catch composition and resulting bycatch and discard rates. Of specific concern is how such a change may potentially impact juvenile horseshoe crabs and the black sea bass fishery. Unfortunately, I do not have the staff resources to further investigate this question at this

time. Moreover, the recreational fishery has expressed continuous concern regarding the minimum size disparity between the commercial fishery (14") and the recreational fishery (16.5") and how this negatively impacts recreational fishing opportunities in inshore waters. Lowering the minimum mesh size would increase the opportunity for the commercial fishery to harvest these smaller grade fish which the recreational fishery does not have access to. Lastly, for 2023, the MAFMC intends to review and revise minimum mesh size regulations and exemptions for summer flounder, scup, and black sea bass. This effort may help further inform discussion at the state level.

Overview of Public Hearing Proposals

Landing Window

Historically, DMF restricted the offloading of summer flounder between 8PM and 6AM. This was done as a measure to facilitate enhanced enforcement, as there was concern that the trip limits were being exceeded by vessels landing under the cover of darkness. With higher trip limits, the incentive to bring in non-conforming quantities of fish is lower. In fact, DMF is willing to set trip limits at whatever level the fishery participants feel is appropriate for that season, so. Accordingly, exceeding summer flounder trip limits should not be an enforcement challenge reducing the enforcement need for such a strict landing window.

During the public scoping meeting in December, DMF heard from dealers and commercial fishers regarding how the landing window has become inconvenient and makes operations less efficient, particularly during the summertime period. Given the economics of the inshore summer flounder fishery in recent years, fewer dealers are sending fewer trucks to Cape Cod to pick up catch. With the summertime congestion on the Cape, it becomes difficult for dealers to service the various ports from Woods Hole to Chatham where vessels may be landing. Having to offload vessels by 8PM creates a time crunch for dealers and fishermen alike. As a result of this, commercial fishers may have to wrap up their day early to meet the truck at the dock. This is time they could spend actively fishing, particularly given the summertime night fishing prohibition does not go into effect until ½ hour after sunset, which frequently occurs after 8PM from late-April through late-August.

For these reasons, I am taking comment on adjusting the landing window. My current preference would be to delay the start of the landing prohibition by two hours until 10PM. However, I am open to hearing from industry and law enforcement on the potential to further liberalize it.

Weekly Aggregate Pilot Program for Trawlers

The concept of a weekly aggregate program has been discussed over the past several years. While Rhode Island adopted such a program back in 2019, I have been hesitant to do so in Massachusetts. My opinion on this has evolved over the past several years given the underutilization of the quota, the attrition in the inshore trawl fishery, and the advancement of electronic vessel tracking and reporting technology. With diminished participation and ample available quota, I think it is critical to consider management options that provide the remaining fleet with opportunities to efficiently access available quota. A weekly aggregate pilot program may provide this opportunity.

Fortunately, Rhode Island has led the way to investigate this concept and we can learn from their experience (see attached RI DEM Assessment Report). Staff and I met with our colleagues at RI DEM on January 12, 2023 to discuss how they manage their program and how they view its overall impact. While Rhode Island's summer flounder fishery functions differently than ours, their industry and managers alike generally viewed their aggregate program favorably. Much was learned from this conversation to help inform the development of a potential pilot program here.

Using Rhode Island as a model, DMF has developed the parameters for a potential program in Massachusetts in 2023. They are as follows:

1. The pilot program would be limited to commercial fishers using trawl gear. This is the sector of the fishery that is the most interested and most likely to benefit from such a program. Commercial hook and liners are not frequently utilizing their daily trip limit of 300 pounds and are unlikely to make multiple day trips to target summer flounder. Fisheries using other gear types that may encounter summer flounder (e.g., gillnets) are occurring exclusively in federal waters and may be satisfied with current trip limits, as they have not requested additional access to the quota.
2. The pilot program may exclude any vessels who are participating in a pilot program in other states. Effectively, such a restriction would prevent vessels who participate in Rhode Island's pilot program to also participate in Massachusetts' pilot program. This may also alleviate concerns expressed about opportunistic fishing effort moving into Massachusetts state waters.
3. Trawlers participating in the biomedical trawl fishery for horseshoe crabs would be restricted from participating in the weekly aggregate program. The priorities of these vessels should be to timely meet biomedical processing demand and handle the horseshoe crabs to maximize survivability. DMF currently allows them to retain and sell lawfully harvested catch obtained during this fishing activity in order to incentivize participation in the biomedical trawl fishery. However, allowing participation in the weekly aggregate program could shift priorities away from the biomedical fishery and may contribute to increased horseshoe crab mortality.
4. Vessels would only be able to opt into the program once per calendar year. Therefore, if a vessel opted in and then opted out, they would not be able to opt in again later in the season. This will ease the administrative burden of the program and will help ensure compliance with the rule excluding participation in another state's pilot program.
5. Participating vessels would be required to submit daily electronic trip reports prior to landing and have a DMF-approved electronic tracking device onboard the vessel. This is consistent with the requirements of Rhode Island's program. These requirements are necessary to aid in enforcement of the weekly aggregate limits, spatial closures, and night fishing prohibitions. It will also provide DMF with the high-resolution data to better understand where fishing effort in the aggregate program is occurring. DMF is considering not authorizing VMS as a viable tracking device because these data are not readily available to the agency and instead require all participating vessels be outfitted with the electronic trackers being required in the federal lobster trap fishery.
6. The pilot program would begin on June 1. This would give DMF ample lead time to administer the program, including: developing the implementing Letter of Authorization and Statement of Permit Conditions; enrolling perspective permit holders; and ensuring participating permit holders have access to electronic reporting and vessel tracking requirements.
7. The pilot program would apply only to the retention of summer flounder and black sea bass. Scup already has a regulatorily set weekly aggregate limit of 10,000 pounds for trawlers. Other commonly caught species (e.g., horseshoe crabs and whelk) would remain subject to daily landing limits. For whelk, the current limit is 1,000 pounds of channeled and knobbed whelk; for horseshoe crabs the limit is currently 300 crabs for permitted trawlers and 75 crabs for non-permitted trawlers, but trip limits in the horseshoe crab bait fishery are subject to change this year.
8. For both summer flounder and black sea bass the weekly aggregate limit would be five-times the current daily limit (i.e., 2,500 pounds of summer flounder per week and 500 pounds of black sea bass per week). While the fishery is open seven-days per week, most vessels are not participating at that frequency given weather, maintenance, and days off. This would allow participating vessels to better choose their fishing days and more effectively retain at least what they would expect to catch over the course of a normal work week. Moreover, it may encourage participation from vessels who have left the fishery in recent years to pursue other fishing opportunities by

making it more economically viable for them to spend a day or two per week targeting summer flounder.

Increasing Summertime Trip Limits

While a weekly aggregate pilot program is DMF's preferred management approach, I will also take comment on a series of trip limit increases that may be in play should DMF determine not to move forward with a pilot program.

For the initial Period II season, I would propose increasing the trip limits from 500 pounds to 800 pounds for trawlers. This proposal is being made consistent with advice from the seafood dealer sector to open our fishery with high trip limits to take advantage of market conditions. Price per pound is generally elevated during the spring and early summer period (Figure 2), as overall supply is low with many states not having a directed fishery at this time of year. This would encourage vessels to fish for summer flounder to start the season and making those trips more profitable. In turn, this may encourage vessels to stay on the south Cape participating in this fishery into the summer.

During September, I am proposing to increase the trip limit from 800 pounds to 1,000 pounds should more than 20% of the quota remain on August 31. While the market for summer flounder tends to be softer during the early-fall (Figure 2), this may make trips more profitable for the vessels who remain in the fishery. Similar to the existing rule, should less than 20% of the quota remain on August 31, then the trip limit would stay at its summertime level. Here the trip limit may be 800 pounds rather than 500 pounds should the April 23 – August 31 trip limit be increased.

Small Mesh Bycatch Allowance

The interstate and federal fishery management plans establish a 100-pound summer flounder bycatch limit when fishing with net mesh less than 5.5". Our current state regulations go a step further and implement this 100-pound limit on any vessel possessing more than 250 pounds of squid. The thinking was that any vessel possessing more than 250 pounds of squid was likely using small mesh and adopting this threshold would prevent non-compliance by eliminating the opportunity to unlawfully target summer flounder with small mesh.

During this past fishing season, DMF received calls from offshore trawlers indicating that the rule restricted their ability to fish with both large and small mesh to target summer flounder and squid during the same trip. Additionally, if the vessel were permitted in another state (e.g., Rhode Island) they would land their catch there, as other states did not have this additional restriction. To better accommodate the offshore fleet, and to better match the management of the trawl fishery in neighboring states, I am proposing to refine this bycatch rule so it only applies to the use of small mesh.

Increasing Fall Trip Limits

I am proposing to increase the October 1–December 31 trip limit from 3,000 pounds to 10,000 pounds should more than 5% of the quota remain on September 30. This is consistent with the in-season adjustment taken by the MFAC in 2022. Recall, the rationale here was to accommodate larger trip limits as the fishery moves offshore and to set trip limits at levels similar to Mid-Atlantic states to encourage vessels to land their fish in Massachusetts ports. Similar to the existing rule, should less than 5% of the quota remain on September 30, then the trip limit will stay at its September level. In this case the trip limit may be 1,000 pounds rather than 800 pounds should the trip limit for September be increased. This will allow landings to trickle in throughout the remainder of the year.

Increasing Period I Trip Limits

I am proposing to increase the Period I trip limit from 3,000 pounds to 10,000 pounds. This is consistent with the in-season adjustment made by the MFAC for the current season. While this will not impact

commercial fishing this year (2023), it would be the regulatory baseline for future years. Recall, the rationale here is to accommodate the offshore trip fishery. Landings during this period will remain capped at 30% of the overall quota. Should the 30% allocation be reached, the trip limit will be reduced to 100 pounds in order to preserve quota for the summertime fishery.

Attachments
September 1, 2022 Letter from Red's Best on Quota Utilization
December 15, 2022 Letter from Red's Best on Summer Flounder Management
December 13, 2022 Industry Scoping Meeting Presentation
RI DEM Assessment of Summer Flounder and Black Sea Bass Pilot Aggregate Management Programs

Figure 1. Annual Running Total of Summer Flounder Landings (2017–2022)

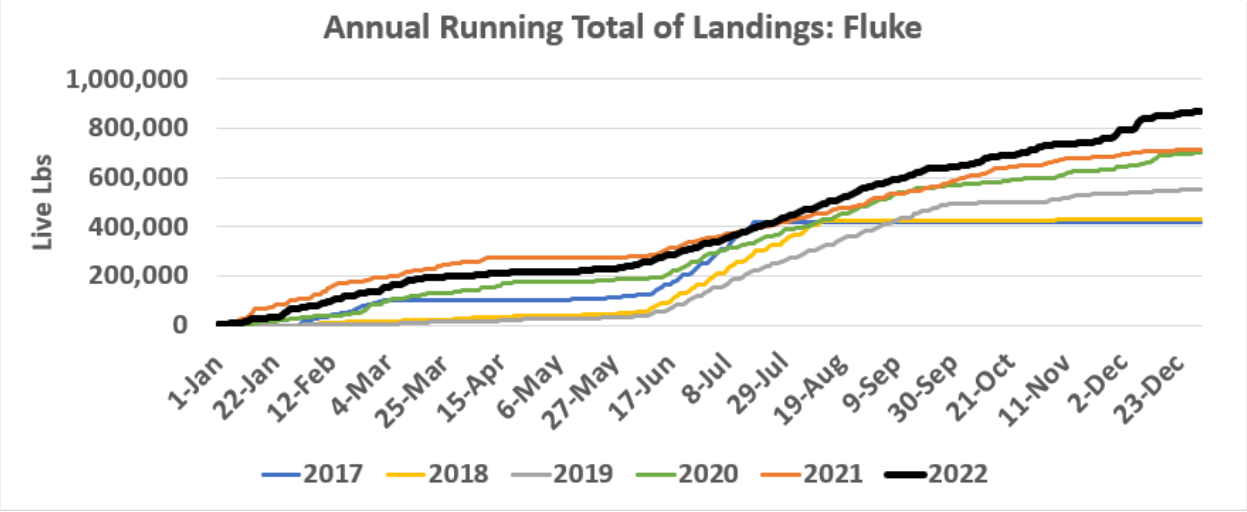
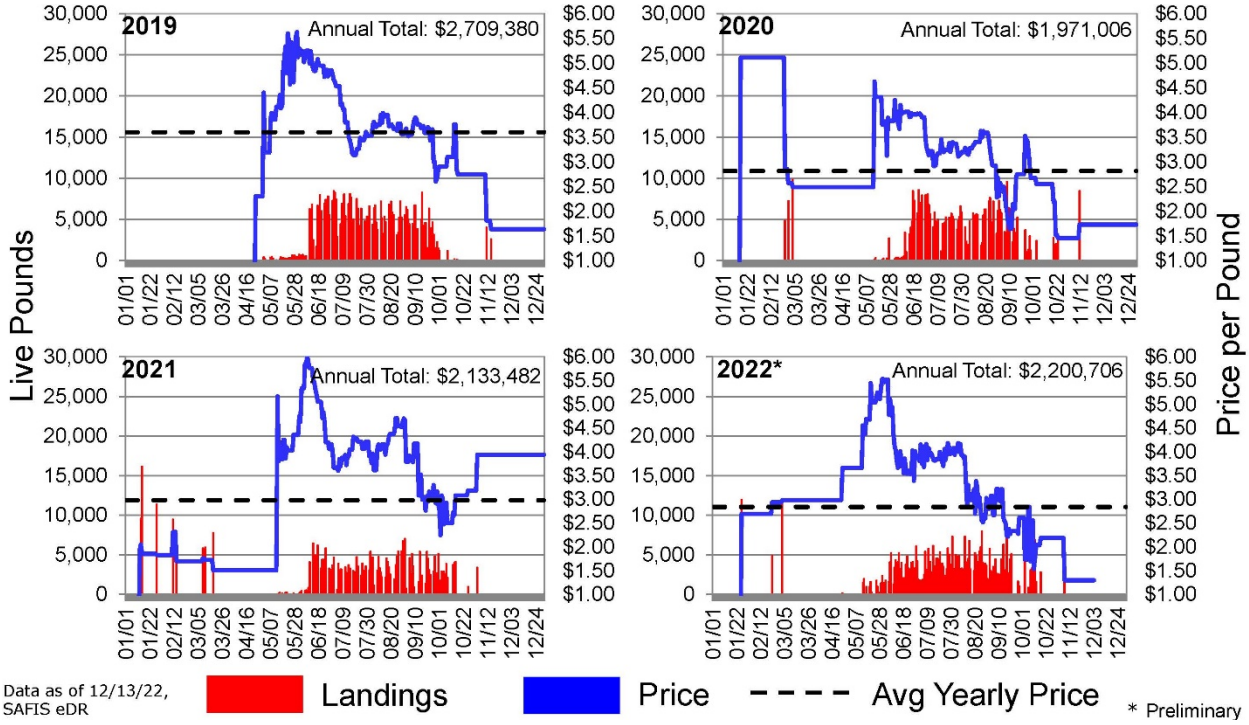


Figure 2. Daily Landings and Average Prices (2019 – 2022)



WildFish LLC, 37 Boston Fish Pier, Boston, MA 02210
tel: 617 830 1672 fax: 857 496 1155
www.redsbest.com

RE: Quota Utilization / Permit Access

September 1, 2022

Hello,

I am writing this letter to strongly encourage the DMF to do everything in their power to harvest the entirety of the Massachusetts fish quotas every year.

In my opinion a big reason we are under harvesting our quotas is because of the difficulty of obtaining permits. We have overcorrected in our attempt to limit entrants in these fisheries. We are now faced with a situation where the fleet is aging out and young people are unable to get in.

I am confident the goal was not to make permits inaccessible (expensive) but rather to limit fishery entrants in order to harvest the quotas in a reasonable amount of time. We are now unable to harvest some very valuable fisheries and it is costing the State millions of dollars every year.

There are certainly solutions to this problem but we need to act fast because the pool of potential new fishermen is disappearing fast.

The underharvesting of quotas is a major problem across many fisheries in the United States and we need to start taking aggressive actions to fix this problem before it is too late and there is nobody left to do the work.

Best regards,

Jared Auerbach, CEO

WildFish LLC, 37 Boston Fish Pier, Boston, MA 02210
tel: 617 830 1672 fax: 857 496 1155
www.redsbest.com

December 15, 2022

RE: Massachusetts Commercial Fluke Fishery

To whom it may concern,

This letter is in support of a weekly aggregate landing limit for fluke in Massachusetts from May 1 - October 1.

We think this limit should be 10,500 per week, 1,500 lbs per day. Regardless of the numbers, we should remove the daily landing restrictions and make sure we catch the full quotas.

We feel that the State has an obligation to make rules that enable fishermen to harvest the entirety of the fluke quota. This has not happened for a number of years.

The only way we can see this getting accomplished is to remove the unnecessary restrictions that fishermen have. We would also like to point out that these unnecessary restrictions cause unnecessary harm to the environment.

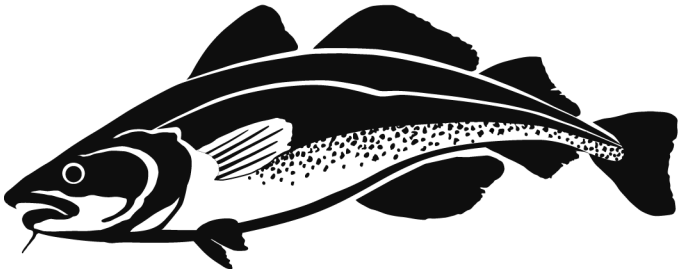
Thank you very much for all of your hard work in regulating our local oceans in a sustainable way. We appreciate all that you do.

Sincerely,

Jared Auerbach, CEO

Public Meeting:
Summer Flounder Management
December 13, 2022

MarineFisheries
Commonwealth of Massachusetts

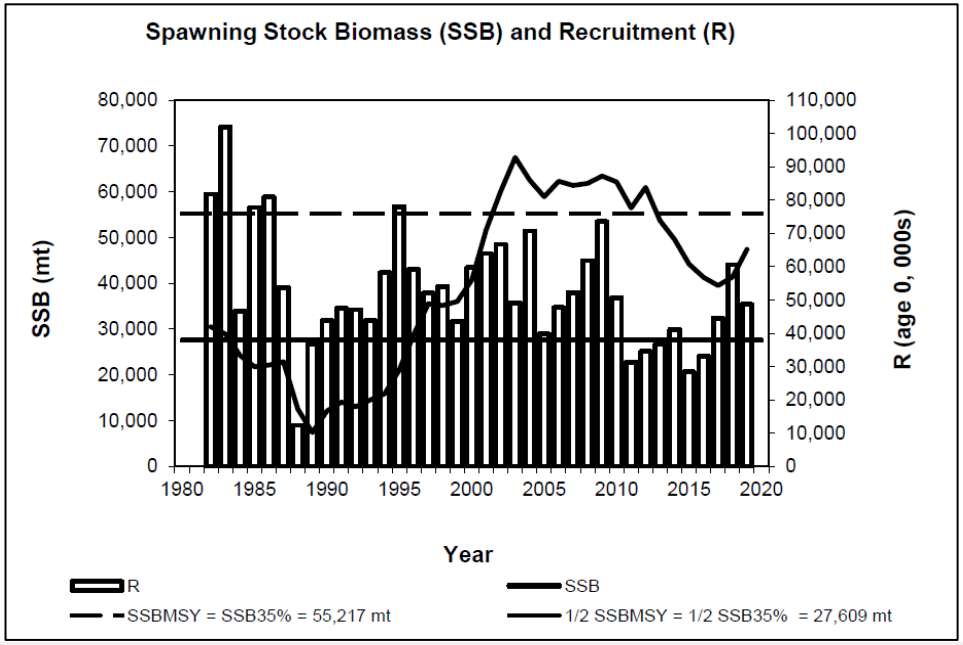


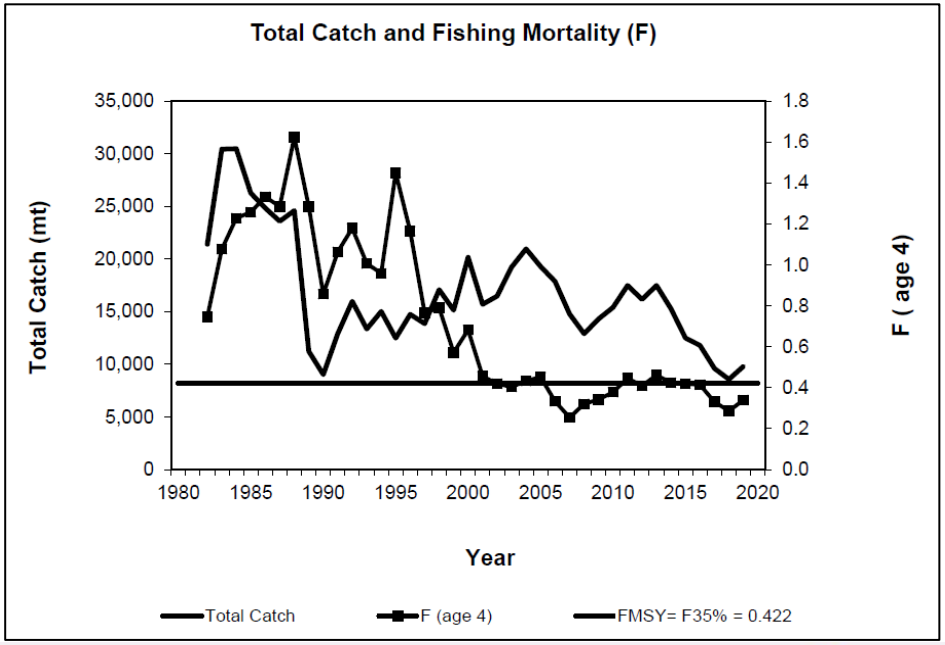
Agenda

1. Summer Flounder Stock Status
2. Summary of Recent Management Changes
3. Review of Recent Performance
4. Discuss Potential Management Solutions

Summer Flounder Stock Status

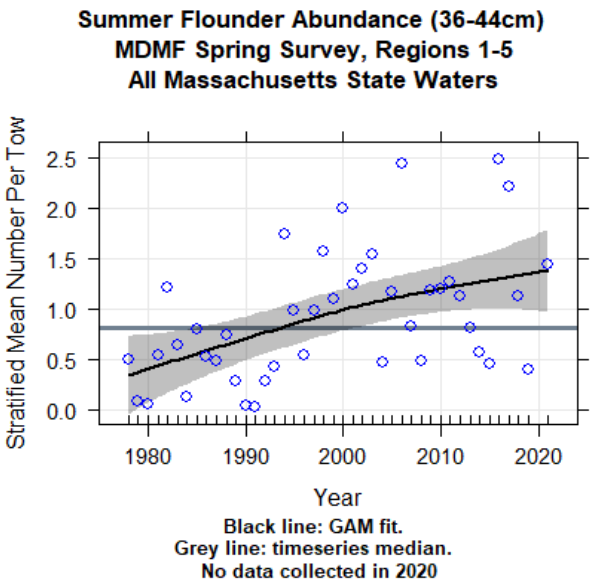
- Source: 2021 Management Track Assessment (data through 2019)
- Not overfished. SSB_{2019} = 47,397 MT, or 86% of biomass target. Note recent upward trend.
- Recruitment: below average 2011-2017 caused recent decline in SSB (driver of pattern unknown); 2018 year class above average, 2019 below average but above 2011-2017.
- Not experiencing overfishing. F_{2019} = 0.34, 81% of threshold.
- Northward & eastward shift in spatial distribution over last four decades.



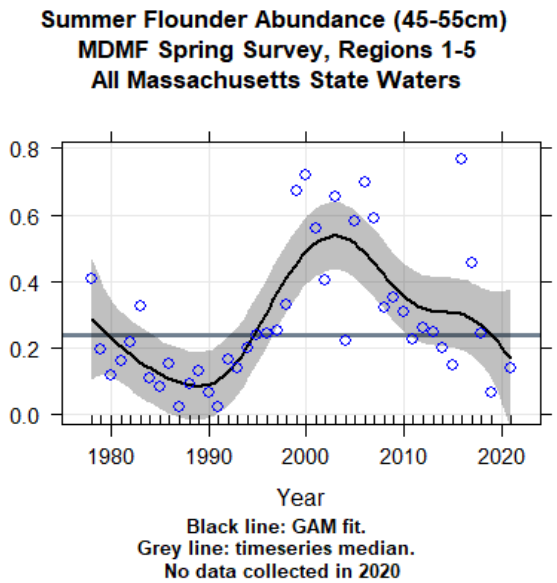


Spring Trawl Survey Abundance by Market Grade

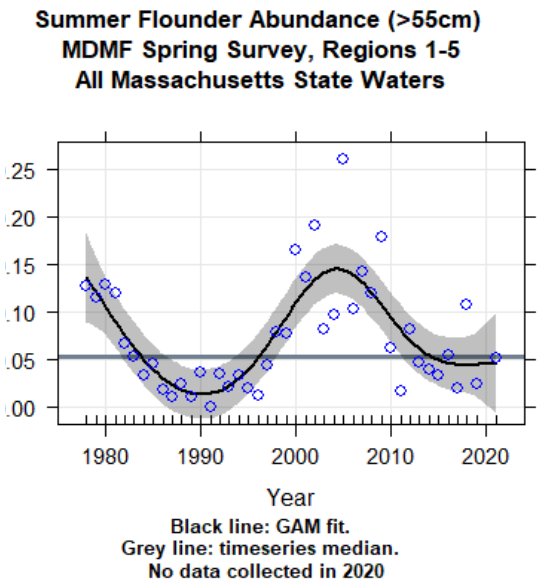
Market Grade: Medium



Market Grade: Large



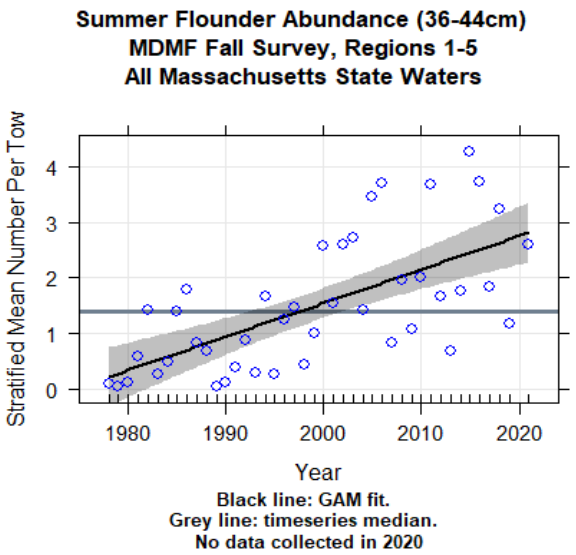
Market Grade: Jumbo



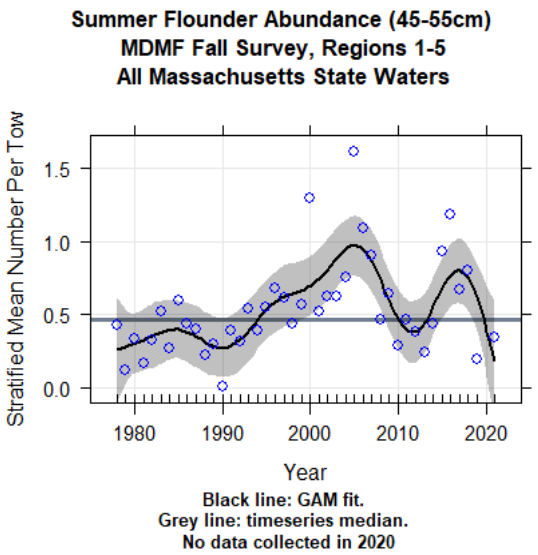
- Trawl survey occurs in May.
- Observed increase in abundance of medium market grade fish.
- Abundance of large and jumbo market grade fish now below time-series mean. Substantial decrease from time-series high in early 00s.
- Expectation is this survey would catch those fish moving into inshore summertime fishery.

Fall Trawl Survey Abundance by Market Grade

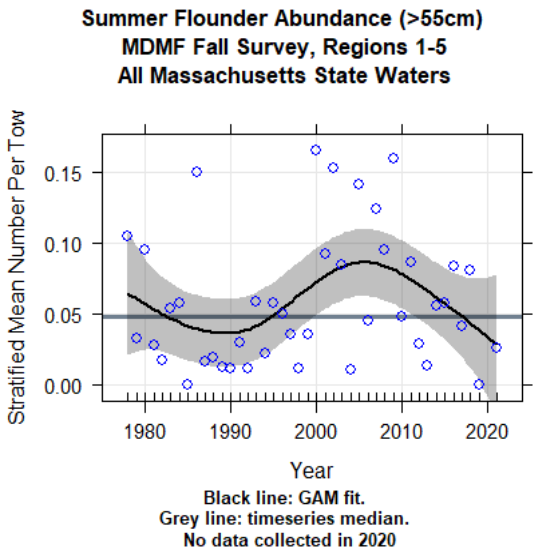
Market Grade: Medium



Market Grade: Large



Market Grade: Jumbo



- Fall trawl survey occurs in September.
- Similar but less pronounced trends than in the spring regarding abundance by market grade.
- Seasonal migration tends to be occurring during the time the fall trawl survey occurs.

Summer Flounder Quota & Utilization

- MA commercial quota expected to be set at 1.36 million pounds for 2023, similar to 2022 quota (1.39 mlbs)
- Quota has steadily increased since all-time low in 2017 with large increases in 2021 (28%) and in 2022 (37%).
- Quota increases occurring coastwide due to stock status. Additionally, MA's quota share increased in 2022 under a new quota allocation approach.
- Quota has been under utilized since 2019.

Year	Quota (lb)*	Landings (lb)	Percent Utilized
2017	389,573	419,714	108%
2018	413,361	427,167	103%
2019	741,532	551,267	74%
2020	795,584	700,390	88%
2021	1,025,159	679,914	66.3%
2022	1,391,379	774,474**	55.6%**
2023	1,360,000^	TBD	TBD

* Quota as adjusted by transfers; ** as of December 13, 2022; ^ approximate anticipated quota.

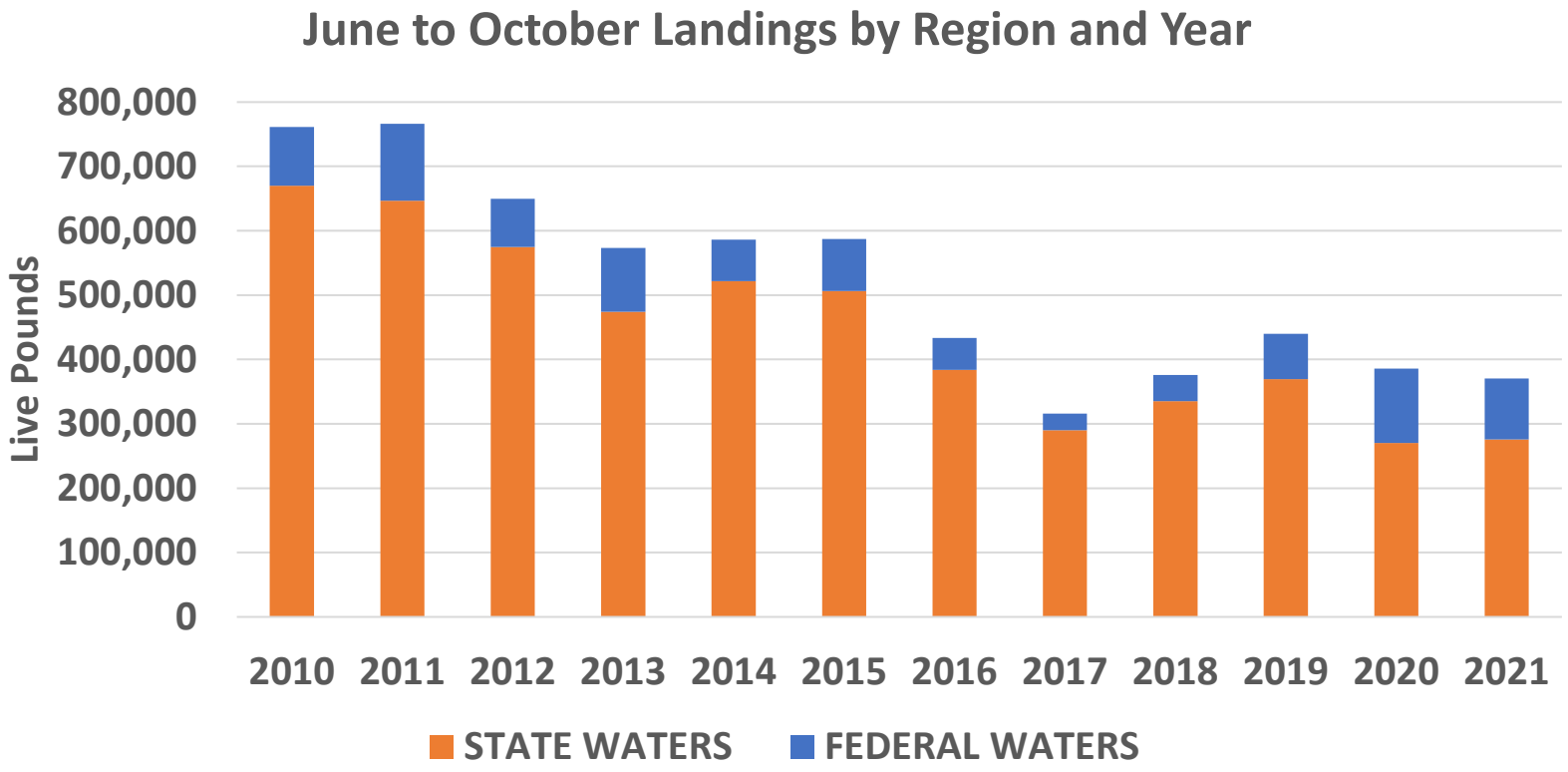
2022 Regulatory Changes

Period	Allocation	Season	Open Days	Trip Limits	Min. Size
Period I	30%	Jan 1–Apr 22	Sun – Sat	~~1,000 lb, reduced to 100 lb at 25% quota use (all gear)~~ **3,000 lb, reduced to 100 lb at 30% quota use (all gear)** **Multi-state possession limit program**	14"
Period II	70%	~~Apr 23–Jun 9~~	~~Sun – Sat~~	~~100 lb (nets), 0 lb (hooks)~~	14"
		~~Jun 10–Oct 31~~ **Apr 23–Aug 31**	~~Sun – Thu~~ **Sun–Sat**	~~400 lb (nets), 250 lb (hooks)~~ **500 lb (nets)*, 300 lb (hooks)**	
		Sept 1–Sept 30	**Sun–Sat**	**800 lb (all gears) if ≥20% quota remains**	
		~~Nov 1–Dec 31~~ **Oct 1–Dec 31**	Sun – Sat	~~1,000 lb (all gear) if ≥5% quota remains, otherwise 500 lb~~ **3,000 lb if ≥ 5% quota remains; 800 pounds if ≤ 5% of quota remains** **Multi-state possession limit program**	

* 100-lb limit applies if more than 250 lb of squid in possession or if fishing with small mesh.

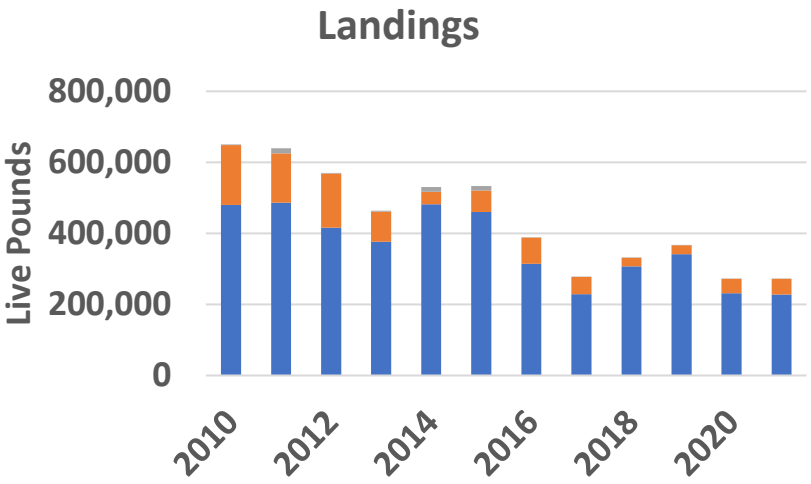
- October 1 – December 31 trip limit increased to 10,000 pounds by in-season adjustment.
- DMF considering in-season adjustment to maintain 10,000 pound trip limit for 2023 P1.

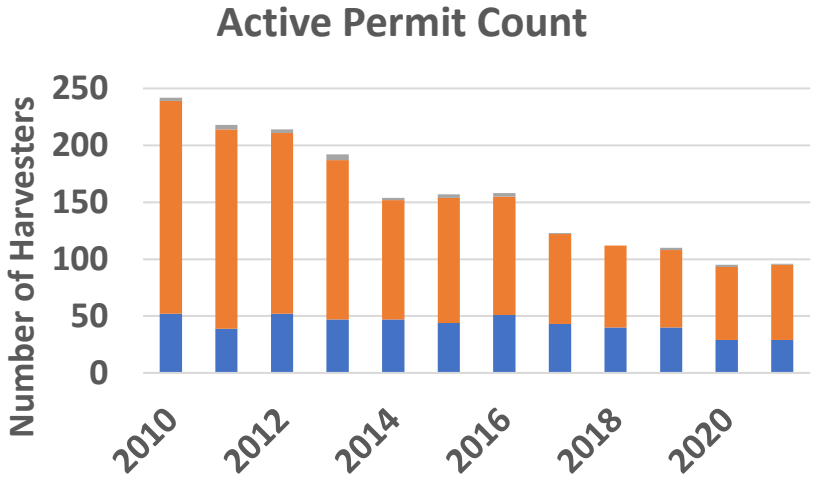
Commercial Summertime Landing Trends by Year and Distance from Shore

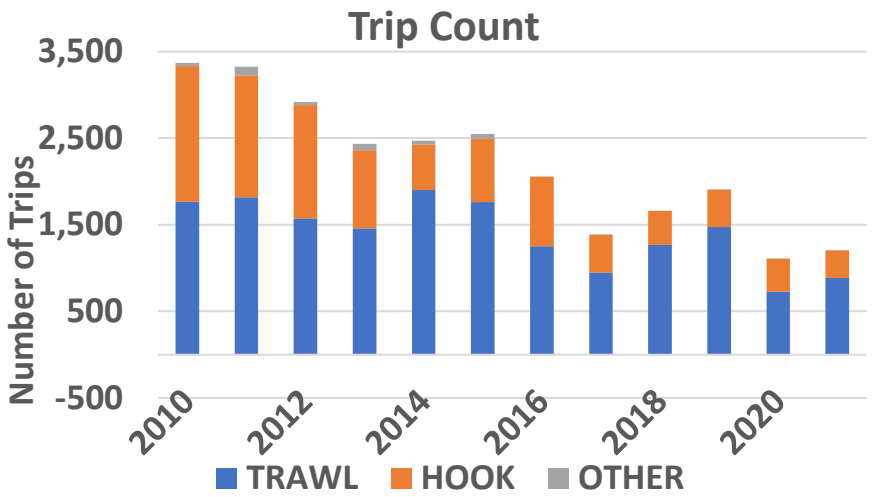


Data as of 12/13/22, SAFIS eTRIPS & federal VTRs

Commercial Summertime Landings, Participation and Trip Count by Gear Type

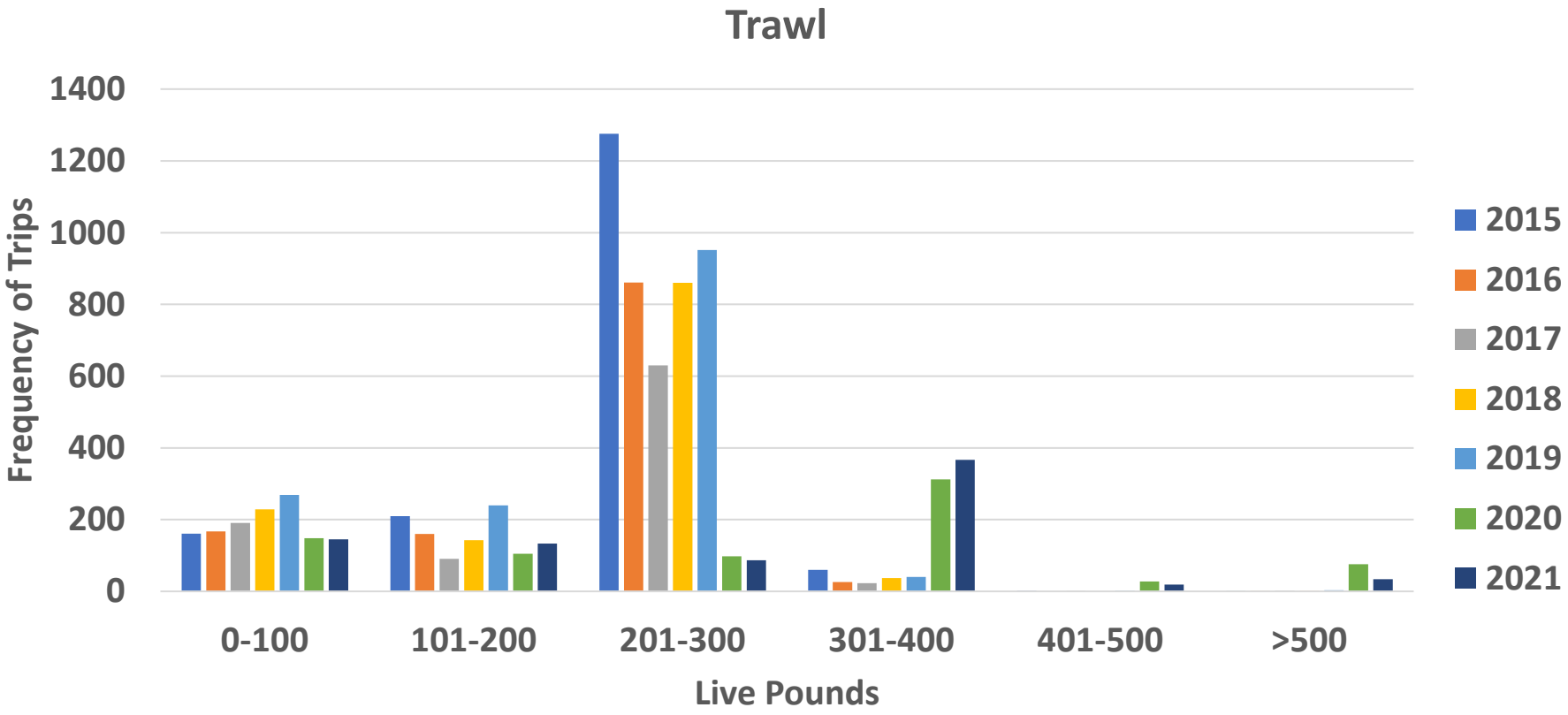






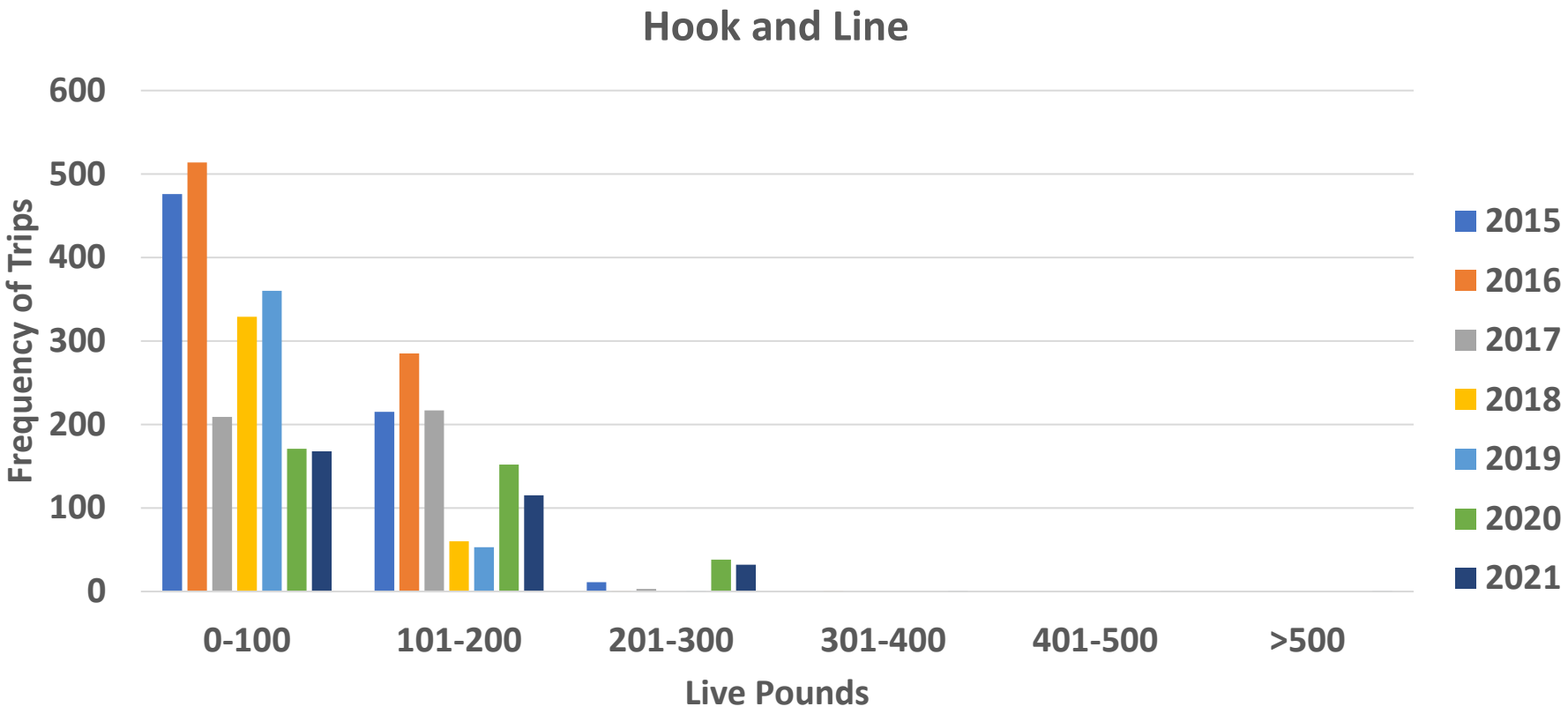
Data as of 12/13/22, SAFIS eTRIPS & federal VTRs

Frequency of Summertime Landings for Trawl



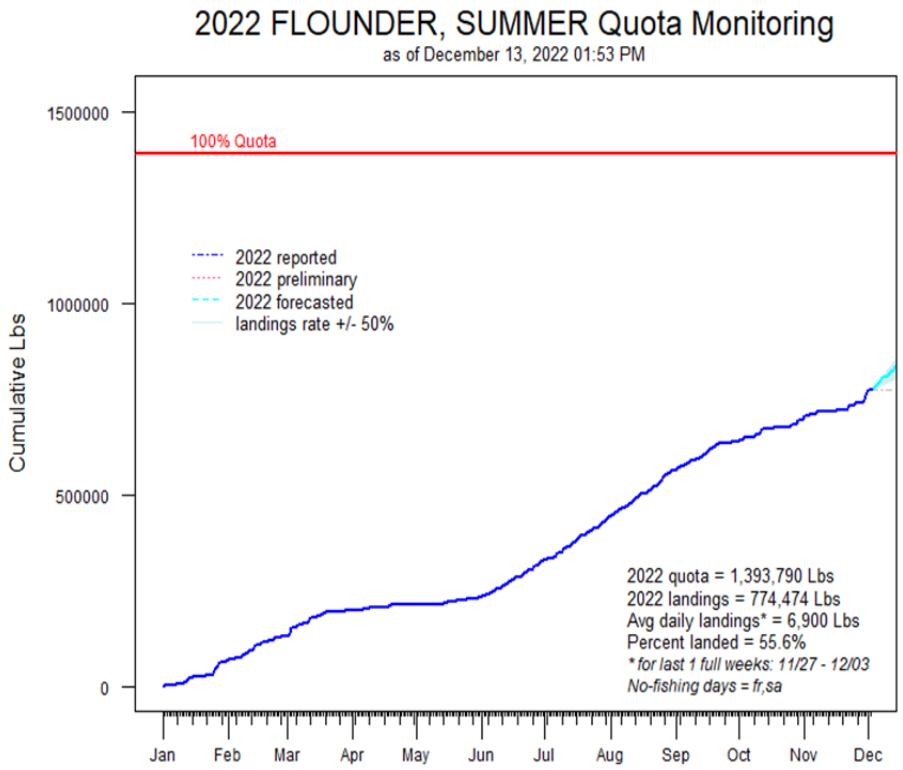
Data as of 12/13/22, SAFIS
eTRIPS & federal VTRs

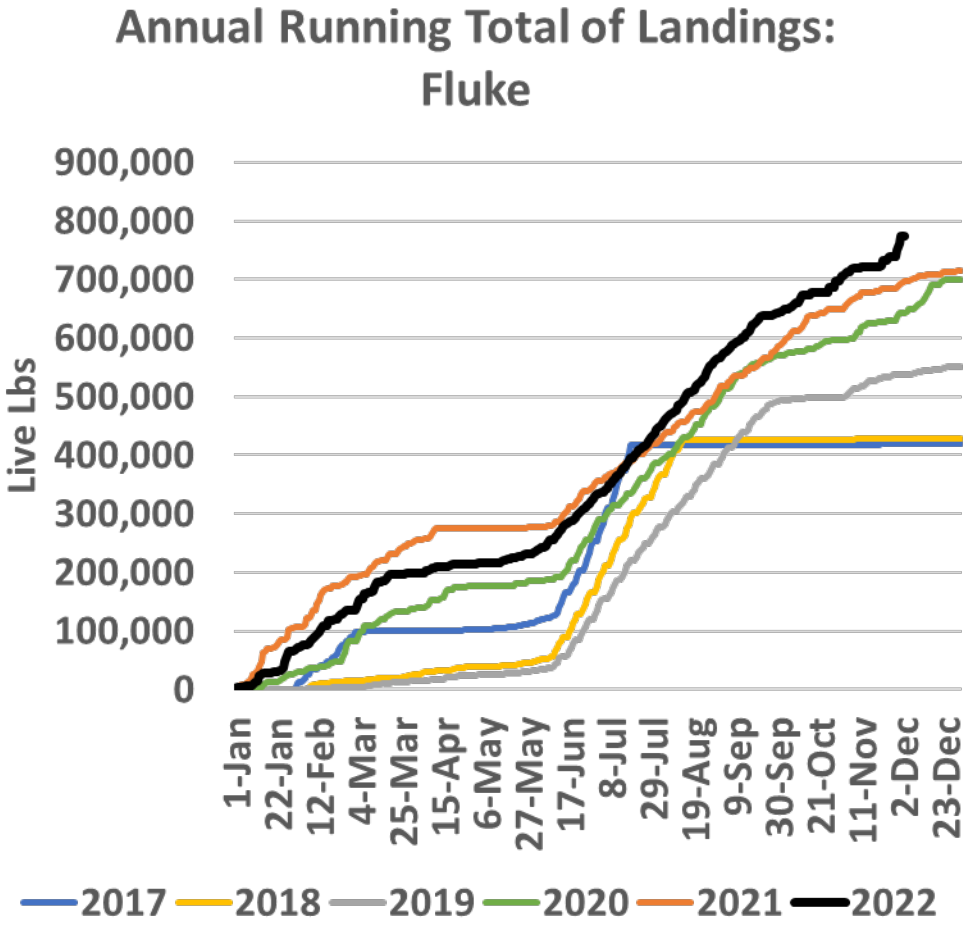
Frequency of Summertime Landings for Hooks



Data as of 12/13/22, SAFIS
eTRIPS & federal VTRs

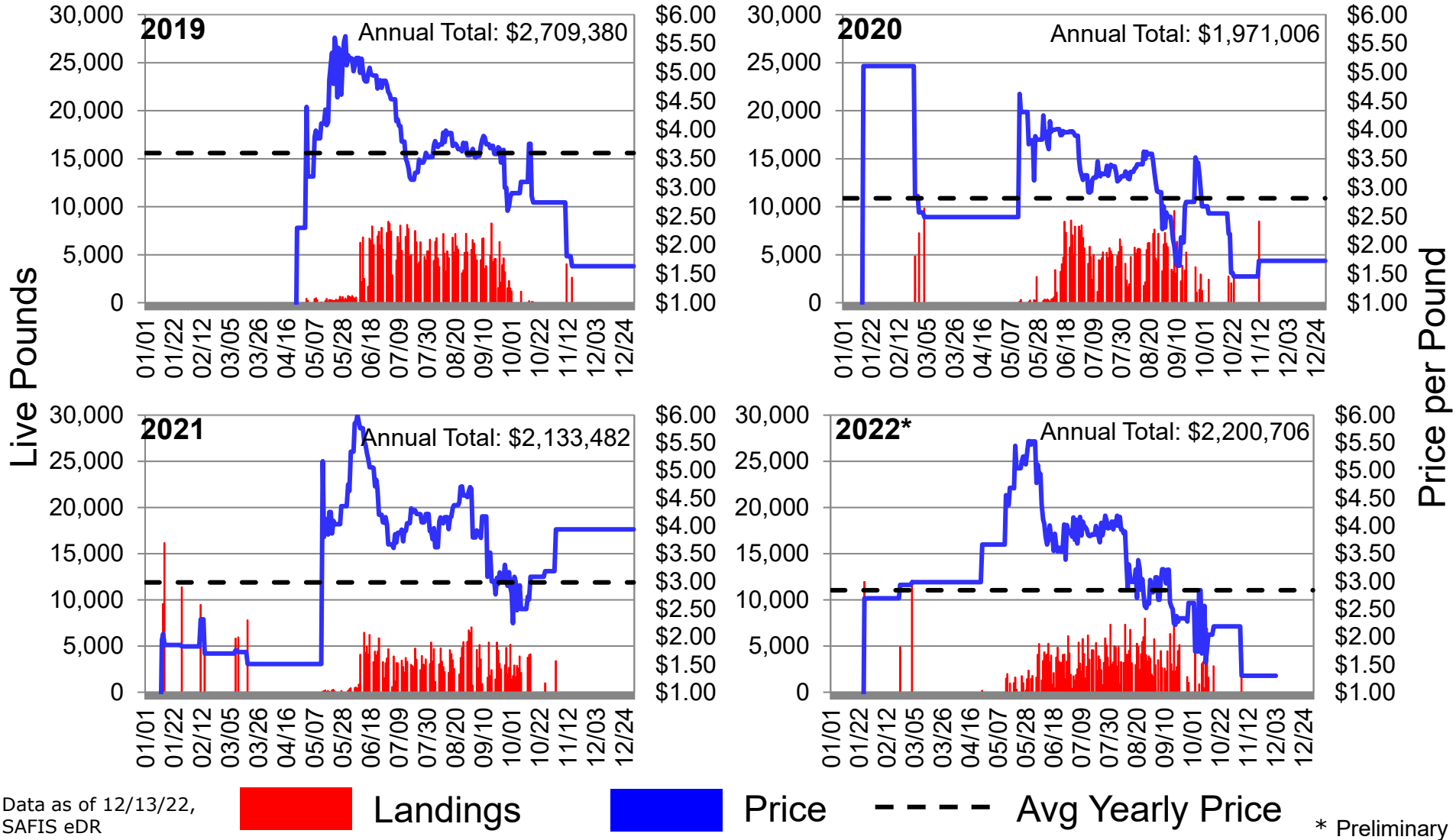
2022 Quota Monitoring





Data as of 12/13/22,
SAFIS eDR

Daily Landings and Avg Prices

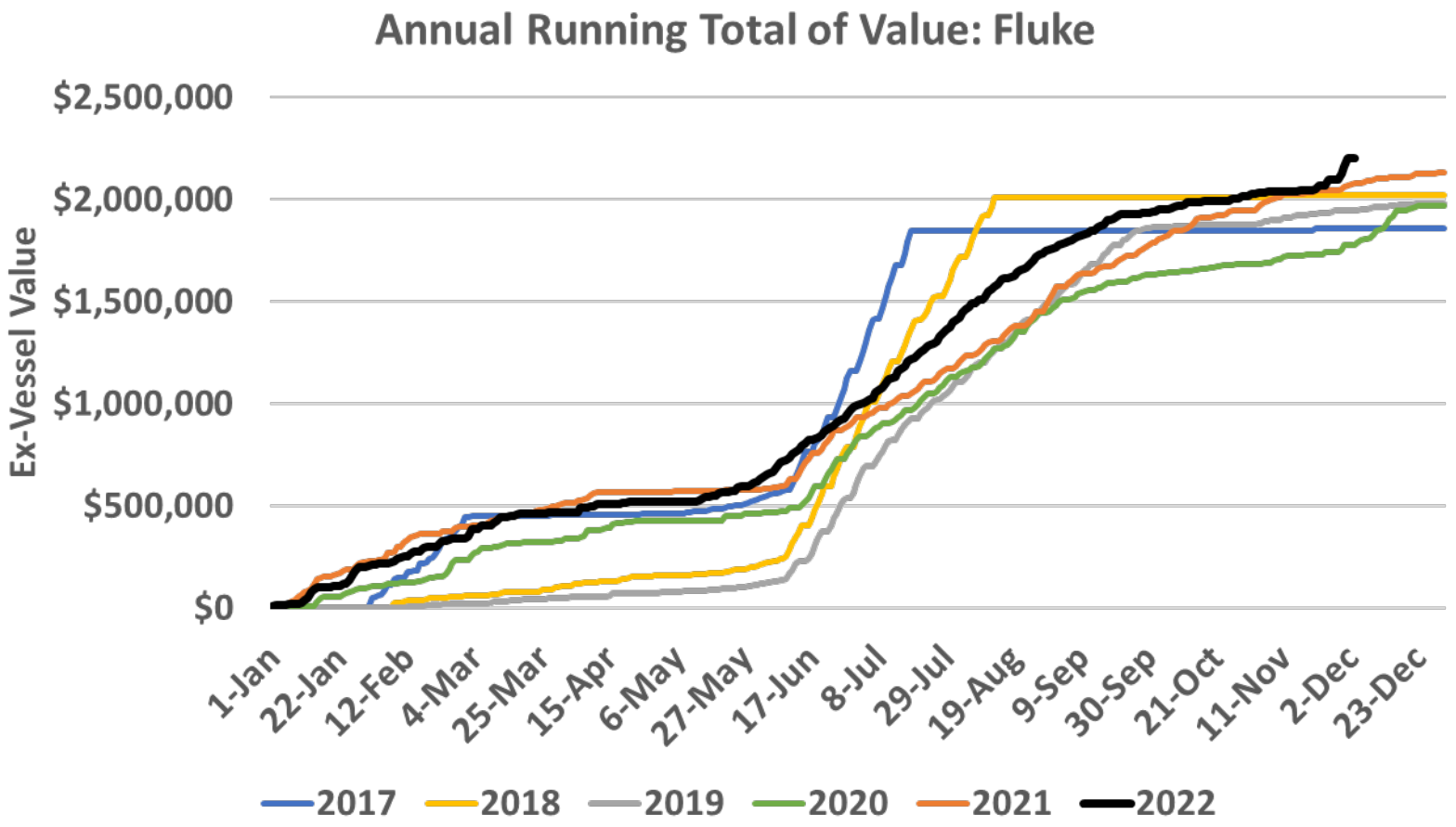


Data as of 12/13/22, SAFIS eDR

Landings Price Avg Yearly Price

* Preliminary

Fluke Ex-Vessel Value Trends



Data as of 12/13/22,
SAFIS eDR

Mesh Sizes by Species Under FMP

Summer Flounder FMP
5.5-inch diamond or 6.0-inch square applied throughout the body, extension(s), and codend portion of the net, except as required in a TED extension
Bycatch allowance for smaller mesh: <100 lb May 1 - October 31, and <200 lb November 1 - April 30

Scup FMP
5.0-inch diamond mesh, applied throughout the codend for at least 75 continuous meshes forward of the terminus of the net
Bycatch allowance for smaller mesh: <1,000 lb October 1 - April 14; <2,000 lb April 15 - June 15; and <200 lb June 16 - September 30

Black Sea Bass FMO
4.5-inch diamond mesh applied throughout the codend for at least 75 continuous meshes forward of the terminus of the net
Bycatch allowance for smaller mesh: <500 lb January 1 through March 31, and <100 lb April 1 - December 31

MA Current Rule: 6.5-inch in cod end and 6-inch throughout year-round in state waters, with exceptions for seasonal small mesh exempted fisheries (e.g., squid).

Potential Management Changes

Options for Change

- Period quota allocation splits?
- Amending trip limits?
- Retention of summer flounder when possessing squid?
- Mesh sizes?
- Permitting and transferability?
- RI-style weekly aggregate limit (pilot program)?
- What else may work?

Questions?

Assessment of the Rhode Island Summer Flounder and Black Sea Bass Pilot Aggregate Management Programs

June 2022

Julia Livermore

Introduction

For years, discussions on aggregate landings programs have garnered interest from the summer flounder, or fluke (*Paralichthys dentatus*), and black sea bass (*Centropristis striata*) commercial fisheries in Rhode Island. The weekly aggregate landing model has been used for fluke during a winter sub-period (January through April) since the 1990s, scup have been managed using a weekly aggregate limit for many years, and a weekly or bi-weekly aggregate landing approach has been used for bluefish since 2015. The commercial quotas for fluke and black sea bass have traditionally been managed through season-specific quotas, changes in possession limits throughout the year, and in some cases closures during certain days of the week. Both fluke and black sea bass are targeted by a large proportion of the commercial fleet (particularly in summer) due to their high demand and relatively high prices at dealers. As such, the daily possession limit of both species is generally low with state quota allocations also contributing to low limits. Given the variability of fish stocks, low quotas, and subsequently low possession limits, combined with rising fuel prices, vessel maintenance costs, safety at-sea concerns, and global pandemics, fisheries managers are striving to provide more flexible fishing programs to the fishing industry.

It is hypothesized that an aggregate program would allow fishermen more flexibility in fishing practices through the utilization of a weekly possession limit instead of a daily limit. Such a program could potentially decrease costs to the fishermen by decreasing days at sea (reduced fuel and vessel maintenance costs) while also increasing safety as fishermen could pick which days are the best in terms of weather. Aggregate programs could also decrease regulatory discards, and thus, discard mortality in some fisheries, especially at times when possession limits are low by reducing the total number of fishing trips. A reduction in number of fishing trips could mean less time and area for mobile gears to be in contact with the bottom resulting in a potential benefit to the related habitat. Aggregate possession limits could also reduce illegal fishing behavior by increasing flexibility and therefore reducing the incentive to harvest over the daily limit.

However, there have been stated concerns from the commercial industry in RI that aggregate programs may: 1) favor individual businesses depending on how they operate; 2) increase catch rates, which can lead to quicker quota consumption and result in shorter fishing seasons due to early closures; 3) cause an increase in fish landed and variability in timing of landings that will oversaturate the market and drive prices down; and 4) lead to an increase in illegal fishing activity due to the potential difficulties in accountability and enforceability. Ideas on how such an aggregate program would impact the function of these fisheries and what the potential mechanisms should be to manage and enforce the program are largely untested.

At the recommendation of certain commercial fishing industry representatives and to address these concerns, the Rhode Island Department of Environmental Management (RIDEM) Division of Marine Fisheries (DMF) brought forth a proposal for a pilot fluke and black sea bass aggregate program in the fall of 2018 to the Rhode Island Marine Fisheries Council (RIMFC), which was passed and implemented in 2019. The goal of the Pilot Aggregate Program was to collect data for assessing the viability of an aggregate program for fluke and black sea bass from May 1 to December 31, where participants would be held to a weekly aggregate limit (daily possession limit times the number of days open) in lieu of a daily limit. With the support of the 2019 Pilot Aggregate Program fishing participants, the program was extended through the 2021 fishing year in hopes of better understanding interannual variability

associated with the program that is imperative to understand before any form of the program can be formally adopted. Increasing the number of participants using each respective gear type was also essential to capture variability among harvesters.

While this pilot aggregate program was specific to the RI fishing industry, other states could adopt similar flexible management opportunities, depending on RI findings. Understanding how fishing businesses respond to aggregate programs may provide justification for other states or regional fisheries to take aggregate program approaches to management for species with small quotas. Fluke and black sea bass are both highly sought-after species coast-wide, with complicated management structures; pilot aggregate program evaluation may help to improve fishing flexibility, while maintaining healthy fish populations.

Harvest and effort data collection (via dealer reporting and state logbooks or federal vessel trip reports) occurred during the pilot aggregate program and all aggregate participants were also required to install a Vessel Monitoring System (VMS) onboard for real-time vessel location monitoring. However, no data collection on the economic and safety components of the program took place initially, limiting state managers' ability to assess program performance in terms of socioeconomic impact. Collection of these data is necessary to determine whether this pilot aggregate program resulted in improved economic efficiency and safety, as intended. Discerning the human behavioral response in terms of changes to fishing activity and business operations is pivotal to understanding what drives changes in harvest. This information is necessary to make informed recommendations about management options that will achieve desired positive impacts for harvesters, specifically stable and predictable harvest to maximize quota utilization within subperiods.

This report presents results from a mixed-methods (qualitative and quantitative) study aimed at addressing this data gap by offering a strategy to collect business information (fuel, bait, ice, grocery, and labor costs, number of days fished, etc.) and perspectives on the program directly from fishermen participating in the program coupled with analysis of landings data for comparison.

Methods

Interviews

To collect participant business information, semi-structured interviews were conducted with pilot aggregate program participants with funding from a grant through the Atlantic Coastal Cooperative Statistics Program (Award Number: NA21NMF4740471). Prior to contacting potential interviewees, a semi-structured interview instrument was developed and approved by the University of Rhode Island's Institutional Review Board, which reviews all research projects involving human subjects to ensure that subjects are not placed at undue risk and that they are ensured informed consent to their voluntary participation. Interview questions focused on perceptions of impacts (i.e., changes to number of trips targeting fluke or black sea bass or costs associated with fuel and bait, whether the program affected the number of discards), behavioral intentions (i.e., changes to number of days at sea or other business decisions), and attitudes towards the program (e.g., positive or negative, what could be done to improve the program).

Sampling efforts attempted to reach all pilot aggregate program participants. This is an example of purposive sampling, which is a common practice for studying individuals of a particular demographic (Bernard and Ryan 2010). Data collection was focused exclusively on participants of the aggregate

programs to allow for assessment of changes to their businesses since joining the program. For the actual pilot aggregate program, starting in 2019, 12 participants were chosen by lottery to represent multiple gear types within the pilot aggregate programs; three otter trawl fishermen, one lobster pot fisherman, three gillnet fishermen, one rod and reel fisherman, three multi-gear fishermen, and one fish pot fisherman. Three participants per gear type were sought in year one, but limited applications for lobster pot, fish pot, and rod and reel participants were received (one apiece). This pool was expanded in 2020 to an additional 18 participants. Three new participants for each gear type were sought in 2020, but not all types met this goal; participants were selected by lottery when more than three applications were received within a gear type. This pilot aggregate program participant pool represented both state-only and federally permitted vessels. New participants brought the totals by gear type to:

- 6 otter trawl
- 6 gillnet
- 2 lobster pot
- 5 fish pot
- 5 rod and reel
- 6 multi-gear (participants whose fishing history was not comprised of over 80% of a single gear type)

Actively fishing pilot aggregate program participants represented between 2.1 % and 6.5% of fishers harvesting summer flounder, and between 2.3% and 6.4% of all RI fishers landing black sea bass across the three years of the pilot program. All 30 program participants were contacted via email (provided when applying for the pilot aggregate program) on October 20th, 2021 requesting to set up an interview. Four program participants responded via email to set up an interview. Based on gear types of those that responded to the email solicitation, an additional 14 participants were given phone calls between October 27th, 2021 and February 24th, 2022 soliciting for interviews. These 14 individuals were selected to address other gear types that did not have as much interview coverage. At least three participants from each gear grouping needed to be interviewed for that gear type to be discussed in reporting, per data confidentiality requirements (ACCSP Rule of Three). Ultimately, a total of 14 program participants were interviewed, representing 47% of the program, as well as one dealer, for a total of 15 interviews conducted. DMF offered embroidered baseball caps to interviewees as a thank you for their willingness to provide information about their experience in the pilot aggregate program.

While a relatively small sample size, 15 interviews represents an acceptable sample size in qualitative data collection. Further, Crouch and McKenzie (2006) recommend that studies not exceed 20 participants to build and maintain trust with participants and allows for optimal open exchange of information. Guest et al. (2006) suggest that data “saturation” (when additional participants do not provide additional insights) occurs around 12 participants in homogeneous groups. Nevertheless, one goal of sampling in qualitative analysis is to ensure that sampling has included a broad set of interests. Given the use of purposive sampling of pilot aggregate program participants only, it is reasonable to assume that this study reached saturation at 12 or more interviews, as a 40% positive interview response rate should achieve an acceptable sample size to determine overall program efficiency for all gear types combined.

Since the COVID-19 pandemic was still ongoing at the time of interviewing, interviews were done either in-person or over the phone, depending on the participant’s preference. Interviews occurred between

October 25th, 2021 and March 7th, 2022 and ranged from ten minutes to one hour and six minutes (mean ± SD = 35.13 ± 16.8). All interviews were recorded and transcribed for reporting accuracy, after confirming that the participant was comfortable with the discussion being recorded and providing either written or verbal consent to the interview.

Data Analysis

Of the fishers interviewed, interviewees represented five different gear types: fish pot (3), rod and reel (4), gillnet (3), otter trawl (3), and use of multi-gear types (1). Based on the Rule of Three, fish pot, rod and reel, gillnet, and otter trawl can be discussed in isolation, while multi-gear cannot. Interviewees had between 12 and 50+ years of work experience in the fishing industry.

Interview recordings were transcribed using Temi transcription services (www.temi.com), and manual correction. Transcriptions were then coded in NVivo software (QSR International 2022) for qualitative analysis. NVivo coding allowed for data to be categorized and synthesized by topic area.

Dealer reports from the Standard Atlantic Fisheries Information System (SAFIS) were acquired, along with state logbooks and vessel trip reports from the Atlantic Coastal Cooperative Statistics Program (ACCSP) Data Warehouse, for all fishing activity resulting in fluke and black sea bass landings between 2014 and 2021. These data were analyzed in R statistical software (R Core Team 2022).

Results

All 15 interviewees expressed positive views of the program. In discussing overall thoughts on the program, the following topics were noted as direct benefits (Figure 1):

- Savings on fuel
- Improved safety
- Opportunity to reduce regulatory discards
- Flexibility to target other species certain days
- Ability to make up lost fishing days
- Better for the environment
- Flexibility to spend more time with family
- Improvements to mental health (reduction in stress)
- Ability to coordinate with dealers on when demand for fish would be highest
- Increased fishing efficiency

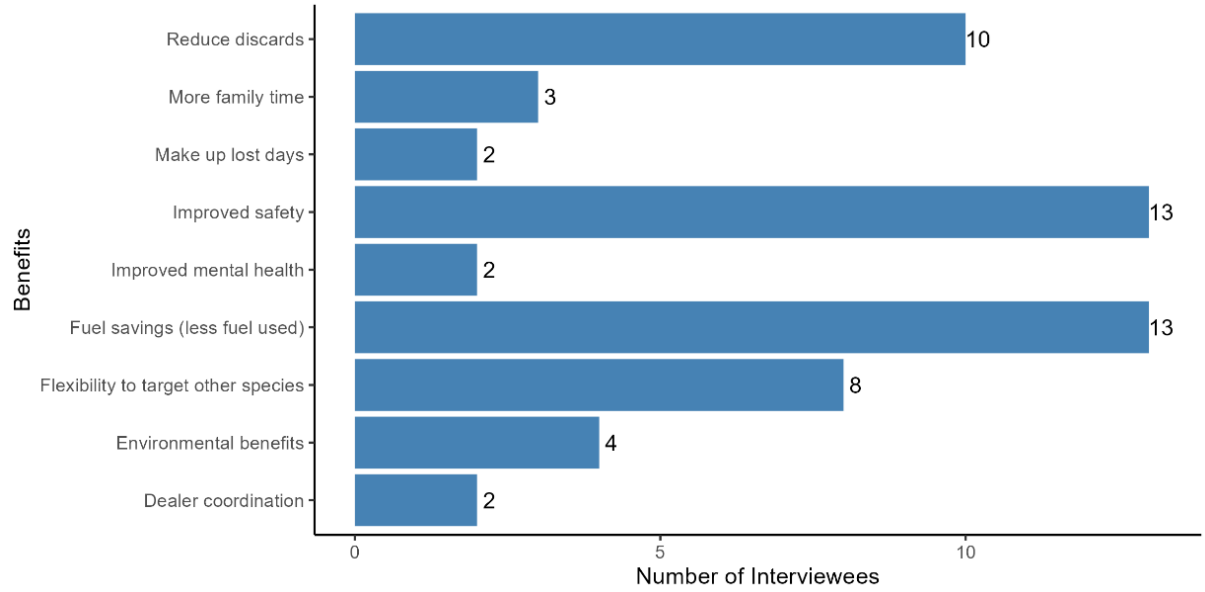


Figure 1. Number of interviewees that noted each respective benefit

The only negative attitude expressed about the program was a concern from one individual that the aggregate landings approach could lead to a reduction in availability of fluke by harvesting the quota more quickly.

The following topic areas were asked about directly within the interviews and summaries of interviewee responses are summarized below.

Safety

Most interviewees (13/15) indicated that the program improved safety. Rationales included the ability to pick fishing days based on weather rather than necessity to catch a daily limit (noted by ten individuals), less time on the water overall (fewer days or shorter days), taking time when needed to make vessel repairs correctly due to reduced pressure to catch a daily limit, and a general ability to avoid risks without losing money.

However, the two remaining individuals said the program had no effect on their safety, primarily because they either fish inshore or are already avoiding bad weather days.

Expenses

Five individuals (one third of participants interviewed) described the pilot aggregate program as either a cost saving or profit increasing program. Based on interviewee responses, savings appeared to be driven primarily by a reduction in the number of trips or overall time at sea, resulting in lower fuel expenses.

Trips

Interview Responses

A slight majority of program participants interviewed (8/15) explained that they took fewer trips during their time in the program. Additionally, two others noted that while they still took the same number of trips, they took fewer to specifically target fluke and black sea bass.

Of those that indicated they had taken fewer trips during their time in the pilot aggregate program, six provided detailed explanations of how the reduction occurred. Those descriptions are as follows:

- For sea bass specifically, one person took 50% fewer trips during the program.
- For the sea bass season, one person went from 21 trips prior the program down to 10 trips (52% reduction).
- One person fished 90-100 days per year prior to the program and during the program fished 75 or fewer days a year (17-25% reduction).
- One person fished 5-7 days a week during the fishing season in years prior and then only fished 2 days a week while in the pilot aggregate program (60-71% reduction).
- One person fished all 7 days a week before being in the pilot aggregate program and then reduced to only 1-1.5 days a week during the pilot (79-86% reduction).
- One person took 90-100 (day) trips per year before the pilot and closer to the mid-seventies during the pilot aggregate program (they described a 15-20% reduction overall).

One of these six also noted that their catch of black sea bass increased while in the program, along with a reduction in the number of trips taken, resulting in a 200% increase in profits during the program relative to prior.

Two interviewees said they took the same number of trips, but their days were shorter and they may have set less gear in the water. Another participant explained that they fished the same number of trips, but kept more fish that would have become discards on trips prior to being in the program. One individual noted that they did not think they had reduced their number of trips during the program, but might do so if fish are not around in large numbers, as individual day trips for a 50-pound limit of black sea bass may not be enough to justify a trip. Finally, one participant also noted that to truly reduce the number of trips, there would need to be aggregate landings allowances for more species.

Fisheries Dependent Data Analysis

Analysis of vessel trip reports in conjunction with landings for all aggregate participants suggests there were reductions in the number of trips by fishers participating in the pilot aggregate program across multiple gear types (Figure 2). For fish pot, most captains had fewer trips in 2020 and 2021 than the 2014-2018 median. Most gillnet and rod and reel fishermen had fewer trips than the 2014-2018 median in all three aggregate years (2019, 2020, and 2021). Lobster pot captains overall had fewer trips during the aggregate time period, but had an equal number of captains harvesting above and below the median in 2020. Trawlers had a similar pattern, where most captains had fewer trips than the median in 2019 and 2022, but an equal number of captains harvesting above and below the median in 2020. Most multi-gear captains had fewer trips than the median in 2019 and 2022, but a larger number of captains with more trips than the median in 2020. Overall, there is a reduction in the number of trips during the pilot aggregate program for aggregate captains relative to their 2014-2018 activity.

It is worth noting that 2020 was an anomalous year for all fishing activity due to the COVID-19 pandemic. While overall pounds landed in Rhode Island of black sea bass and summer flounder increased from 2019 to 2020 (39% and 2%, respectively), the value associated with those landings decreased between the two years (12% and 16%, respectively). Therefore, the low price of ex-vessel landings during the pandemic may have affected harvester behavior.

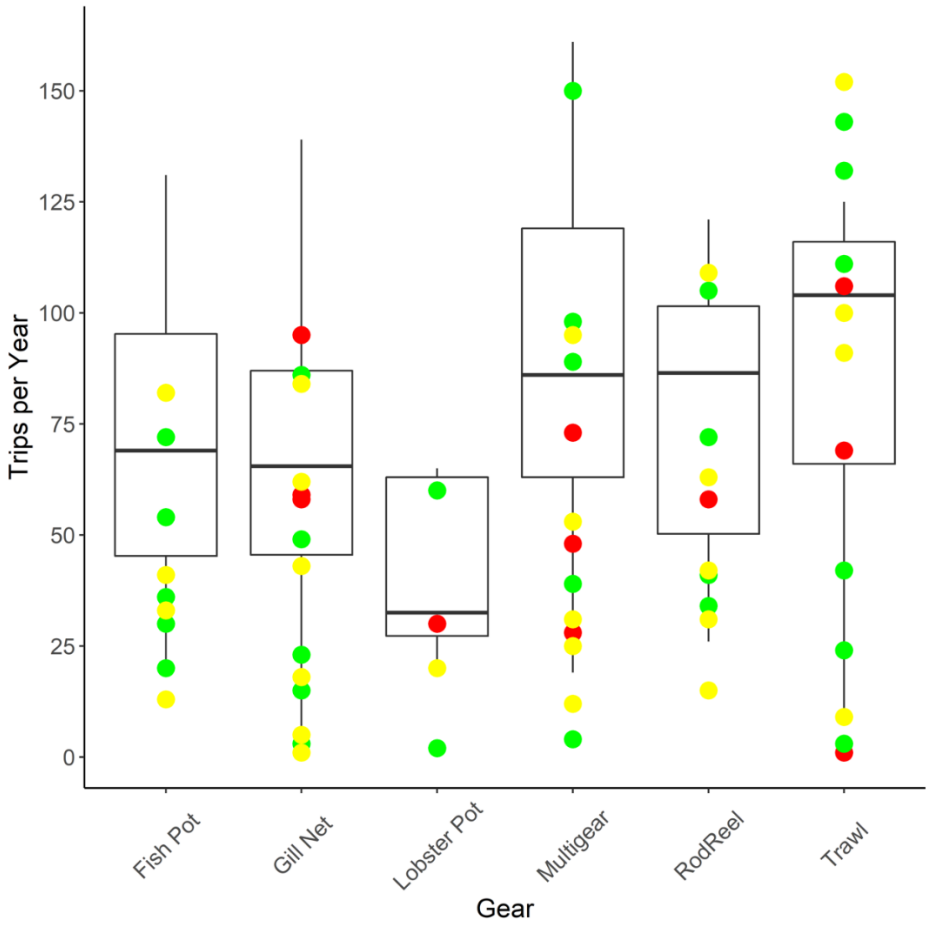


Figure 2. Trips per year for all pilot aggregate program participants by gear type (not just those interviewed). Box plots represent number of annual trips from 2014-2018 and dots represent number of trips during pilot aggregate program participation. Dot color corresponds to pilot aggregate program year, where red is 2019, green is 2020, and yellow is 2021. Figure and analysis conducted by Richard Balouskus, Principal Biologist, RIDEM DMF.

Fuel

A reduction in fuel usage was noted by 13 individuals. For most gear types this resulted from a reduction in the number of trips, but for some gillnetters, their days on the water were shorter because they were able to set fewer nets while still hitting their weekly target catch. One person noted no change in fuel usage, while another was unsure because they targeted other species more as a result of the program, so parsing out fuel usage to target fluke and black sea bass alone was not possible.

Bait

For gear types that use bait (i.e., fish pots and rod and reel), five participants stated that they thought the pilot aggregate program resulted in savings on bait costs. Two others suggested there was no effect on bait expenses, while another two discussed challenges in determining whether changes in bait costs were associated with the pilot aggregate program. Bait prices were noted to be increasing during the program period, and two discussed how they switched from using clam bellies as bait to squid gurry in an effort to save money. However, this had nothing to do with the pilot aggregate program.

Labor

Participants generally thought that labor costs did not change due to the pilot aggregate programs. Only one individual suggested a reduction in labor costs, while seven others stated that they did not observe any changes in paying for crew associated with the program. The majority of interviewees noted that they worked alone or with family members, so there was no change to crew expenses during the program versus prior years.

Wear and Tear

Six interviewees indicated that the program likely resulted in a reduction in wear and tear on either the vessel and/or fishing gear. Of these six, three stated that these reductions were limited in scope and hard to parse out. The other three noted specific situations including replacing gear less frequently because it spent less time in the water, gear not needing to be modified as much to target different species, or a reduction in vessel maintenance time and costs.

An additional two individuals believed that the program had no effect on costs or time associated with vessel or gear maintenance.

Discards

One of the key topic areas discussed by participants related to the program's impact on discarded fish. Of the 15 individuals interviewed, ten (two thirds of those interviewed) stated that they thought the program reduces regulatory discards. Two others suggested that the program may reduce discards, one of which stated that there was no change to their discard numbers, but for other gear types it is likely to reduce them. One additional interviewee stated that they had the same number of dead fish, but got to keep fish that would have been discards previously because they fished the same number of days as before. Only one individual thought that there was no change to discards due to the program.

A key point expressed by multiple individuals was that the program's effect on discards may be different by gear type. For example, it was noted that controlling discards with gillnets can be challenging, but this program does allow for more fish to be kept that traditionally may have been discarded. However, another perspective was that if you hit your target catch more efficiently each week, you may fish less for aggregate species, resulting in fewer discards.

Changes in Catch

Interview Responses

For some gillnetters, the program allowed them to reach their weekly possession limits (equaling more than they would catch fishing on daily limits) because they could catch a large enough amount to make fishing worthwhile.

For fish potters, one noted that their catch of black sea bass increased even while the number of trips decreased because they were able to keep more fish on a single trip.

Two individuals also suggested that catch (and profits) were higher because the pilot aggregate program prevented them from having "lost" fishing days. Being able to land in aggregate allowed them to make up for "lost" days, where historically, if they had not fished, that access to the daily possession limit was eliminated.

Fisheries Dependent Data Analysis

Landings data were analyzed to evaluate the difference in catch of black sea bass and fluke of participants in the pilot aggregate program relative to those harvesting under daily possession limits. The number of aggregate participants landing black sea bass in each year differed (Table 1); not all eligible participants landed black sea bass in 2020 and 2021.

Table 1. Number of aggregate and non-aggregate participants fishing in each of the three program years. The number of total aggregate program participants in 2019 was 12 and was increased to 30 in 2020 and 2021.

Species	Year	Aggregate	Non-Aggregate	% Aggregate
Black Sea Bass	2019	12	515	2.3%
Black Sea Bass	2020	29	452	6.4%
Black Sea Bass	2021	25	448	5.6%
Summer Flounder	2019	10	473	2.1%
Summer Flounder	2020	25	384	6.5%
Summer Flounder	2021	21	404	5.2%

In all three pilot years, aggregate participants landed more pounds of black sea bass each week than non-aggregate harvesters on average (Figure 3). Distributions of average weekly catch differed statistically between the two across the three years (Kolmogorov–Smirnov test p-value < 0.001).

Aggregate participant numbers landing summer flounder also differed each year (Table 1); in all three years, not all eligible participants landed summer flounder. Similar to black sea bass landings, aggregate participants generally landed more pounds weekly of summer flounder than non-aggregate harvesters on average in 2019, 2020, and 2021 (Figure 4). Average weekly catch distributions also differed between aggregate and non-aggregate harvesters (Kolmogorov–Smirnov test p-value < 0.001).

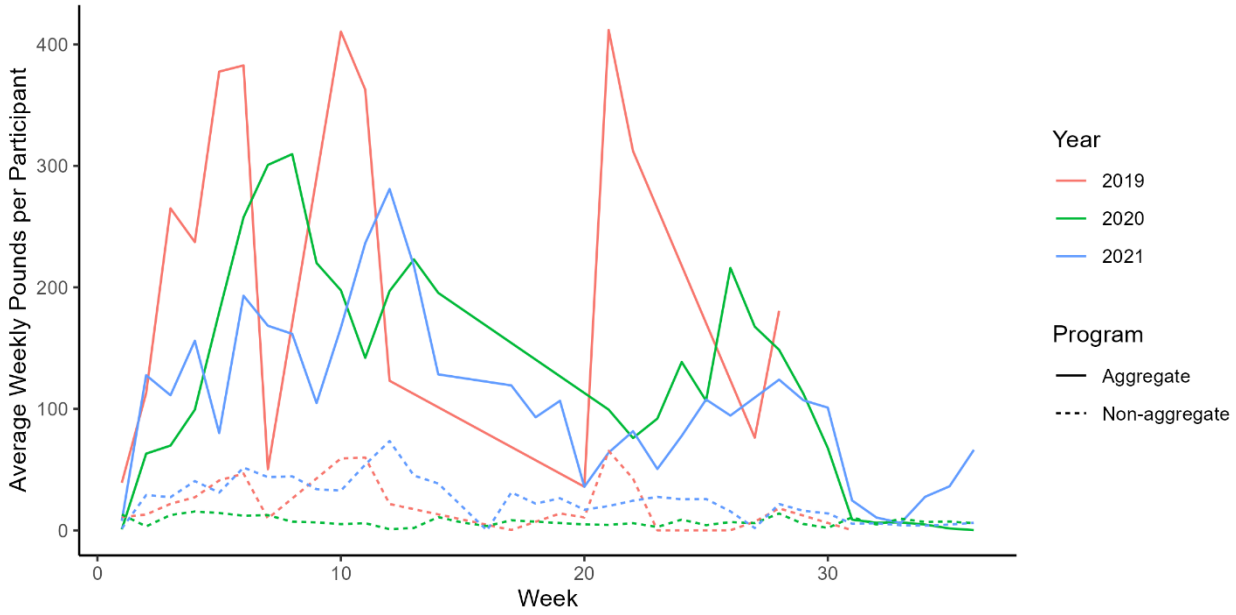


Figure 3. Average weekly pounds of black sea bass landings from 2019-2021 separated by aggregate versus non-aggregate participants. The aggregate landings period was only in effect from May – December each year. Only weeks during the aggregate period are included in this plot. Black sea bass harvest was closed in December of 2019 due to reaching the state's quota allocation.

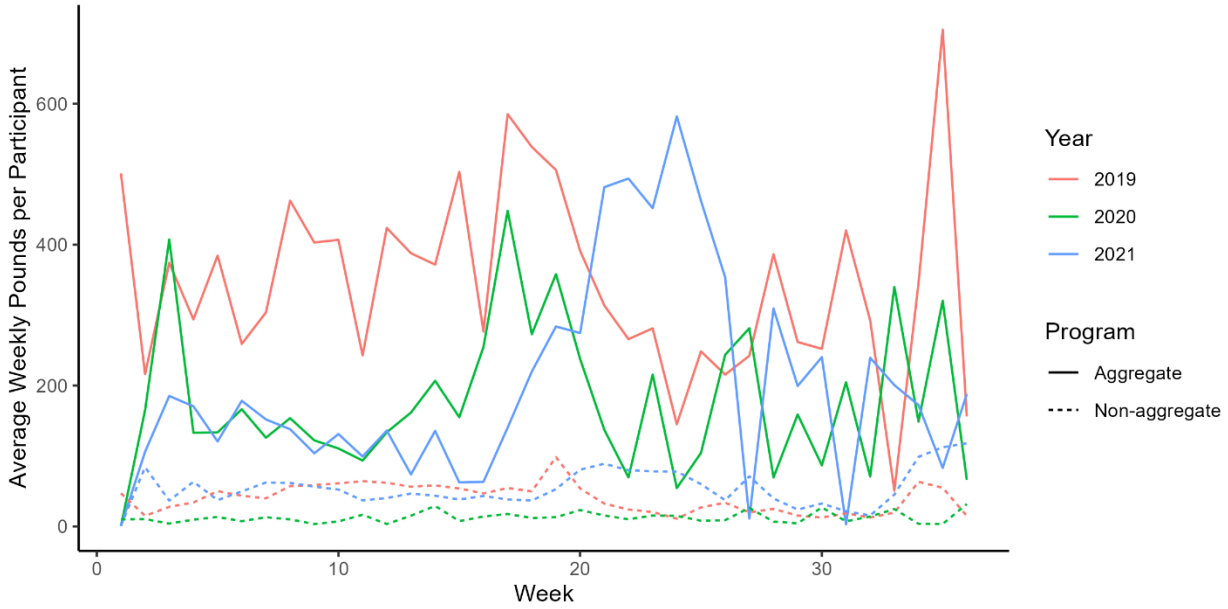


Figure 4. Average weekly pounds of summer flounder landings from 2019-2021 separated by aggregate versus non-aggregate participants. The aggregate landings period was only in effect from May – December each year. Only weeks during the aggregate period are included in this plot.

Quota Interactions

Interview Responses

It was unclear through the pilot program whether black sea bass and summer flounder quotas would be substantially affected by an aggregate landings approach. Eight interviewees noted potential program interactions with quota, but responses were primarily describing concerns with exhausting quota if the entire fleet could land in aggregate. However, others argued that since the total weekly possession limit is no higher for aggregate participants, there should be no effect.

Fisheries Dependent Data Analysis

RIDEM DMF staff conducted simulations extrapolating harvest rates of those within the pilot aggregate program to the entire fleet and found that the quota may be exhausted more quickly; results were presented at a public workshop on January 10th, 2022.

Suggested Program Improvements

Interviewees offered a variety of suggestions on how the program could be improved moving forward. Three individuals suggested that other species, or all species, should be allowed to be landed in aggregate; tautog and striped bass were the most frequently suggested additional species.

Two interviewees noted concerns with the vessel monitoring system (VMS) requirements and suggested that the VMS requirement should be eliminated, or communication on why it is necessary be improved. One such comment was about technical challenges with these systems and the other comment was a preference to not have vessel location tracking, unless absolutely necessary for enforcement purposes.

Two interviewees suggested that no changes be made to the program, only that it be extended temporally. One individual suggested opening the program up to all RI commercial harvesters while others explicitly argued against that approach and advised the DMF to only expand the pilot aggregate program to collect more data on catch variability among program participants.

Finally, for those interviewees concerned with aggregate programs causing the quota to be exhausted too quickly, two suggestions were offered: 1) one individual recommended allowing a weekly aggregate limit, but having a daily limit built in, where this daily limit is larger than the non-aggregate daily possession limit, and 2) another individual suggested having the aggregate weekly limit be a function of fewer days than total days open (e.g., 6 days x the daily possession limit instead of 7 days).

Conclusion

Perceptions of Program from Fishing Industry Perspective

Based on the interviews conducted in 2021 and 2022, participant perceptions of the pilot aggregate program were overwhelmingly positive, with some neutral comments (i.e., no changes or improvements relative to past fishing activity), and one negative comment (a concern about potential impacts to the summer flounder quota). All interviewees expressed a desire to stay in the program, depending on its future format, but most noted that they simply wanted to see the program continue in some form. One interviewee suggested that the number of days per week to determine the aggregate limit could be modified if aggregate landings were found to accelerate quota depletion. However, another noted explicitly that if the number of days were reduced, they would leave the program and chose to fish daily possession limits instead to maximize their catch. This tradeoff was ultimately discussed by the RIMFC.

Perceptions of Program from Management Perspective

From the perspective of the DMF, the pilot aggregate program was successful in garnering interest from the fishery to participate and allowing for tracking of landings data for comparison to non-aggregate activity and tracking impacts to the state quota. The pilot also enabled successful integration of VMS tracking and enhanced data collection into a new management program. Based on the interviews, the program was also successful in achieving a variety of program targets: 1) reducing regulatory discards, 2) increasing flexibility for commercial harvesters in terms of how they conduct their fishing activity, which may enable adaptability in light of changing ocean and market conditions, and 3) creating conditions where fishermen may be able to harvest more efficiently and save money or increase profits.

As previously noted, one of the drivers for the fishing industry to recommend an aggregate landings approach for high-value, low possession limit species was to reduce the incentive to harvest over the daily possession limit. The DMF agreed that an aggregate landings approach could potentially reduce perverse incentives created by small daily possession limits and the VMS requirement could further limit illegal activity. Whether this pilot aggregate program succeeded in changing incentives remains to be evaluated directly, but the RIDEM Division of Law Enforcement (DLE) used pilot program participants' VMS to monitor their fishing activity throughout the program. Law enforcement approached the pilot aggregate program with some trepidation due to concerns over a lessened ability to readily identify non-compliance in trip limits and a need to ensure accountability on the part of the fishermen. With the inclusion of a VMS requirement, these concerns for identifying non-compliance were lessened. DLE has recommended that all future aggregate programs make VMS mandatory. The DLE still has concerns with the prolonged administrative procedure to sanction permits for documented violations and recommends that consideration be given to immediate permit sanctions upon documentation of said violation; a similar process is employed in other jurisdictions and future programs could explore the feasibility of additional enforcement measures.

Future Directions

In early 2022, the RIMFC discussed the fate of the pilot aggregate program and evaluated three potential options: 1) eliminate the program, 2) implement the program indefinitely in some capacity, or 3) continue the pilot program with some modifications to test for additional uncertainties. Ultimately, on March 7th, 2022, the RIMFC voted to extend the pilot aggregate program another year (through 2022), and to expand the number of participants to 58, with no restrictions by gear type. They also modified the program to using five days instead of seven to determine the aggregate limit for black sea bass. This will allow for an additional year of data collection to help address questions that remain unanswered. For example, the expanded pilot aggregate program should help to provide additional data on the rate of quota depletion, given the uncertainty around the simulations and the speculative answers from program participants.

However, some questions remain untested. For example, future research should seek to quantify the change in discards associated with an aggregate landings program. This could include fisheries observers onboard commercial vessels to collect information on the number of black sea bass and summer flounder discarded, as well as information on size, sex, and maturity of discarded fish.

Further, analysis on the variability in catch between aggregate and non-aggregate participants across program years is necessary to better understand potential drivers. This should include incorporation of year class effects for both black sea bass and fluke to determine whether differences may be attributed

to the program or external influences. Additional modeling incorporating market factors (e.g., COVID-19) should also be conducted, as well as more detailed characterization of program participants versus the larger fishing fleet targeting fluke and black sea bass. Questions also remain on how representative the pilot aggregate program participants are of the Rhode Island fluke and black sea bass fisheries.

DMF staff intend to conduct more detailed data analyses on these topics following an additional year of data collection to include the 2022 fishing year with more aggregate participants. These results will be compiled into a manuscript for publication upon completion.

References

Bernard, R., and G. Ryan. 2010. Analyzing qualitative data: systematic approaches. SAGE Publications: Thousand Oaks, California.

Crouch, M., & McKenzie, H. (2006). The logic of small samples in interview-based qualitative research. Social Science Information, 45(4), 18. doi: 10.1177/0539018406069584

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. Field Methods, 18(1), 24. doi: 10.1177/1525822X05279903

R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Commercial Summer Flounder Rules

Proposals

1. Adjust landing window so that vessels may offload summer flounder from 6AM to 10PM, rather than 6AM to 8PM.
2. For summertime Period II fishery (April 23–September 30), either:
   a. adopt a weekly aggregate pilot program for trawlers exempting them from daily limits in favor of a weekly limit, or.
   b. increase the trip limit for trawlers from 500 pounds to 800 pounds with a scheduled increase to 1,000 pounds on September 1 (rather than 800 pounds) if more than 20% of the quota remains
3. Adjust the bycatch allowance provision for the small mesh squid fishery. Rather than setting at 100-pound limit for summer flounder when fishing for small mesh or when in possession of more than 250 pounds of squid, have this limit only apply when fishing with small mesh.
4. For the fall Period II fishery (October 1–December 31), increase the trip limit from 3,000 pounds when more than 5% quota remains and 800 pounds otherwise to 10,000 pounds when more than 5% of the quota remains and 1.000 pounds otherwise.
5. For Period I (January 1 – April 22), increase the regulatorily set limit from 3,000 pounds to 10,000 pounds.

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MAURA HEALEY, Governor | KIMBERLEY DRISCOLL, Lt. Governor | REBECCA TEPPER, Secretary | RONALD S. AMIDON, Commissioner | DANIEL J. MCKIERNAN, Director

MEMORANDUM

TO: Marine Fisheries Advisory Commission (MFAC)

FROM: Daniel J. McKiernan, Director

DATE: February 8, 2023

SUBJECT: **Proposal to Adjust Commercial Horseshoe Crab Limits for 2023**

Proposal

I am proposing to make several adjustments to the management of the bait and biomedical horseshoe crab fisheries in 2023. The proposals are as follows:

1. Permitting.
    a. Establish a new biomedical horseshoe dealer permit.
    b. Establish a new biomedical processor dealer permit. This permit may be limited in issuance.
2. Conservation.
    a. Adopt a January 1 – May 31 closure to all horseshoe crab harvest and rescind the existing five-day closures around each new and full moon from mid-April through June.
    b. Establish an annual processor quota for the biomedical fishery of 200,000 horseshoe crabs. This quota will be allocated evenly among biomedical processors.
    c. Reduce the bait quota by 25,000 horseshoe crabs from 165,000 to 140,000 horseshoe crabs.
3. Bait Fishery Trip Limits
    a. Consider increasing the trip limits for all permitted bait harvesters up to 500 crabs. Current limits are 300 crabs for permitted trawlers and 400 crabs for permitted hand harvesters.
    b. Consider re-issuing Letters of Authorization to certain mobile gear fishers who do not hold a horseshoe crab permit to land a full trip limit of horseshoe crabs, not the 75-horseshoe crab incidental limit.
4. Reporting. Beginning in 2024, require daily electronic reporting for all bait and biomedical harvesters.
5. Permit Conditions. Adopt certain existing permit conditions affecting biomedical harvesters, biomedical dealers, and biomedical processors in regulation.

Background on Life History and Management

Horseshoe crabs are a marine arthropod that range along the Atlantic coast from the Gulf of Mexico to the Gulf of Maine. Horseshoe crab populations are rather localized with animals showing site fidelity to their spawning beaches. Juveniles tend to inhabit near shore embayments and estuaries; then, once mature, they move out several miles from shore as adults only to return inshore to spawn (Shuster, 1982; Button and

Ropes, 1987). Spawning occurs throughout the spring—predominantly May through mid-June—with peak activity usually corresponding with lunar tides (both new and full moons). During spawning, the animals will stage nearshore and then lay their eggs along sandy beaches.

Here in Massachusetts, we are near the northernmost extent of the animal's range with Cape Cod providing a natural geographic barrier. Accordingly, most of our stock (and resulting fishing activity) occurs south and west of Cape Cod, with some notable local populations north of Cape Cod (e.g., Wellfleet Harbor, Barnstable Harbor) and along the outer Atlantic Coast (e.g., Nauset Estuary, Pleasant Bay).

The stock assessment for this species is conducted by the Atlantic States Marine Fisheries Commission (ASMFC), with the most recent being the 2019 benchmark assessment. Given the stock as a whole consists of many localized meta-populations, this stock assessment evaluated the stock status by region based on survey trends; biological reference points to define "overfished" and "overfishing" are not used. Rather, the stock status is relative and determined based on the percentage of surveys within a region having a greater than 50% probability of the final assessment year being below 1998 levels—the year the ASMFC initiated its Horseshoe Crab Fisheries Management Plan (FMP). A region's stock is considered "poor" if more than 66% of surveys meet this criterion; "good" if less than 33% of surveys meet this criterion; and "neutral" if between 34% and 65% of the surveys meet this criterion.

The northeast region is comprised of Rhode Island, Massachusetts, New Hampshire, and Maine (Figure 1). However, given the species geographic range, it effectively consists of Massachusetts and Rhode Island. The 2019 benchmark assessment indicated our stock status improved from "poor" to "neutral" (see attached 2019 ASMFC Stock Assessment Overview). This was largely due to Massachusetts' relatively strong survey indices. Both our spring and fall trawl surveys show increasing abundance over the past 10-year stanza in terms of both mean stratified number of horseshoe crabs caught per tow (Figures 2 and 3) and the percentage of tows with horseshoe crabs present (Figures 4 and 5). Additionally, our spawning beach surveys show improving trends for most sites (Figure 6). Given these facts, I am of the view that we have successfully managed our local horseshoe crab populations over the past 10-years, benefiting from steady and predictable harvest rates, lunar spawning closures, and spatial protections afforded by harvest prohibitions within the Monomoy National Wildlife Refuge and the Cape Cod National Seashore and bait harvest protections in Pleasant Bay.

Overview of Horseshoe Crab Fishery in Massachusetts

Here in Massachusetts, we have separate bait and biomedical fisheries for horseshoe crabs. The bait fishery principally provides bait to whelk pot fishers. The biomedical fishery provides horseshoe crabs to biomedical firms to extract limulus amebocyte lysate ("LAL") from the animal's blood; LAL is highly valuable and is FDA-approved to detect and quantify bacterial endotoxins in medical equipment. Biomedical firms may also participate in the so-called "rent-a-crab program" where they lease live horseshoe crabs from bait dealers for bleeding and then return the crabs to the bait dealer for sale as bait. DMF strongly supports the rent-a-crab program as it maximizes the utility of each horseshoe crab harvested.

While each fishery has its own discrete management program, both are subject to the state-wide minimum size of 7" prosomal width (widest part of the horseshoe crab) and to lunar spawning closures. The lunar spawning closures occur during the five-day period around each new and full moon (i.e., two days prior, day of, two days after) from April 16 – June 30.

<u>Bait Fishery</u>

The bait fishery is subject to an annual quota. Our quota was first set by Addendum I to the ASMC FMP (2000) at 339,337 horseshoe crabs annually. DMF was not confident about the accuracy of the data used

to calculate this quota. Subsequentially, DMF and the MFAC moved to voluntarily cut the state's quota to 165,000 horseshoe crabs in 2008 and it remains at this level today.

The bait fishery is principally prosecuted by hand harvesters and trawlers. Hand harvesters collect horseshoe crabs along the shoreline during the spring spawning period; whereas trawlers catch crabs when participating in the mixed species trawl fishery south and west of Cape Cod in Nantucket and Vineyard Sounds, which occurs from the late-spring and into the fall. Participation is generally subject to a limited entry permit regulated fishery permit endorsement for horseshoe crabs ("horseshoe crab endorsement") with trip limits based on harvest method. Hand harvesters with a horseshoe crab endorsement are subject to a trip limit of 400 horseshoe crabs and trawlers with a horseshoe crab endorsement are subject to a trip limit of 300 horseshoe crabs. While most trawlers participating in the mixed-species fishery in Nantucket and Vineyard Sounds have a horseshoe crab endorsement, a small number do not (typically between two and five annually). To discourage regulatory discarding—and in attempt to retain effort in this important inshore commercial fishery—DMF has established a 75-horseshoe crab open entry trip limit for trawlers who do not have the horseshoe crab endorsement. Additionally, DMF may issue these commercial fisheries Letters of Authorization to retain a more substantial limit of horseshoe crabs, particularly if there is demand from bait dealers or the rent-a-crab program.

The bait fishery is also prohibited within the waters of Pleasant Bay. This closure was implemented on an emergency basis in 2006 and then adopted permanently in 2007. This was done in response to a surge in hand harvest effort coming from Cape Cod shellfish fishers displaced from municipal shellfish fisheries due to extensive red tide closures. This watershed is a unique in that it is likely an isolated population of crabs that can be quickly depleted in response to increases in harvest. For this reason, the area was closed to bait fishing, but remains open to the biomedical harvest given the catch and release nature of this fishery.

Over the past decade (2013 – 2022), the bait fishery has harvested approximately 134,000 crabs per year (Table 1). Over this stanza, annual landings increased above the 10-year mean in 2018—with the fishery exceeding its annual quota in 2019 and nearly achieving the quota again in 2020. Landings returned back towards the mean this past year (2022) with the fishery landing 134,753 crabs.

Table 1. Horseshoe Crab Landings by Count and Year (2013 – 2022)

Year	Landings (ct)
2013	112.056
2014	117,349
2015	106.966
2016	100,095
2017	134,707
2018	145,837
2019	177,252
2020	163,295
2021	155,966
2022	134,753

Data Sources: SAFIS Dealer Data

Since 2010—when DMF first implemented the lunar spawning closures—we have observed a shift in landings away from the hand harvesters towards the mobile gear sector, principally trawlers. In the two years prior to the spawning closure (2008 and 2009), the mobile gear fishery contributed between about 15,000 – 20,000 horseshoe crabs per year, comprising about 12 – 23% of the annual harvest. Then beginning in 2010, we see the mobile gear sector take more crabs annually and become responsible for a greater proportion of annual landings. In 2021, the mobile gear fishery took almost 90,000 crabs and was responsible for more than 60% of that year's landings. (Table 2).

This shift was not surprising to DMF. We anticipated landings from hand harvesters would become diminished as spawning closures would limit their seasonal access to the resource. While this may have been the case to some extent, it does not explain the whole picture, as we are not seeing a substantial change in annual landings attributable to hand harvester. Rather, we are observing a sizeable increase in dragger caught landings. This may be because the resource is more available to this gear type given the

improving local population indices and/or because it is becoming a more important component of this trawl fleet's catch. As we have discussed over the past several years, this trawl fleet is facing a variety of conditions causing attrition and an overall reduction in participation. In order to overcome economic challenges and remain active fishery participants, it is likely that vessels remaining in this inshore trawl fishery are now more inclined to directly target horseshoe crabs to enhance the profitability of the trip.

Table 2. MA Bait Horseshoe Crab Landings by Count, Gear Type and Year (2008 – 2021)

YEAR	HAND	MOBILE	OTHER	% MOBILE
2008	64,822	20,397	3,706	23%
2009	59,117	18,118	1,527	23%
2010	49,427	21,169	1,428	29%
2011	35,185	37,468	13,750	43%
2012	53,079	56,346	9,128	48%
2013	70,396	85,609	3,856	54%
2014	77,035	50,902	2,567	39%
2015	68,065	45,270	3,065	39%
2016	63,936	46,925	967	42%
2017	68,554	58,588	4,681	44%
2018	70,643	84,378	3,981	53%
2019	79,186	85,606	1,823	51%
2020	66,852	76,721	961	53%
2021	52,546	89,603	2,784	62%

Data Sources: MA ACR and TL Reports, NMFS VTRs

A consequence of this increase in landings from the mobile gear sector is a change in the size distribution of crabs caught. Our market sampling data shows the average prosomal width of a female Massachusetts bait crab has decreased from a mean of 10.1" from 2008 to 2013 to 9.2" in 2022 (Figure 7). This is a predictable result of the increasing harvest by trawlers. The hand harvest fishery exclusively targets the large adult animals present along spawning beaches, whereas the trawl fishery catches a wider size distribution of animals given the location of the fishery and the size selectivity of trawl nets. With this change in size distribution of catch, we are now harvesting more juvenile animals than we previously were.

Biomedical Fishery

Before I begin to discuss the biomedical fishery in detail, it is important to discuss data confidentiality rules. G.L. c. 130, §21 prohibits DMF from disclosing any fisheries statistics unless we can do so in summary form. To this, we apply the so-called "rule of three" which requires the summary be comprised of data from at least three dealers, harvesters, or other reporting entities to be considered non-confidential. Much of the data regarding harvest, bleeding activity, and observed mortality is confidential, as there are fewer than three biomedical firms involved in the processing of horseshoe crabs in Massachusetts and reporting these data to DMF. However, for the first time ever in 2022, we can release the total number of biomedical horseshoe crabs sold because this data is coming from three or more dealers and harvesters. This is the product of multiple dealers working on behalf of the biomedical firms. All other 2022 data remains confidential.

At present, the biomedical fishery is not subject to an annual cap on harvest or mortality, nor do we limit entry to participate at the processor, dealer, or harvester level. These are conditions that lend themselves to potentially unconstrained growth. We do manage daily harvest through a 1,000-horseshoe crab trip limit. This is not a biologically based metric, but instead reflects the traditional capacity of biomedical harvesters handling horseshoe crabs for the biomedical industry. Biomedical firms are not limited to Massachusetts' biomedical fishery for their horseshoe crabs. Existing regulations allow biomedical firms to also source crabs from the rent-a-crab program and from dealers in other states (subject to regulations in that jurisdiction).

At present, any person can participate as a harvester or dealer in this fishery provided they have a working relationship with the biomedical firm. This ensures all biomedical harvesters are working on behalf of a

biomedical firm and the horseshoe crabs being harvested are being sold exclusively for biomedical processing. To permit the biomedical fishery, DMF issues a bait dealer permit to the biomedical firm and any dealer working on behalf of a firm and a special biomedical harvester permit to any person harvesting horseshoe crabs on behalf of a biomedical firm (or their associated dealer). Management of the biomedical fishery principally occurs through annual permit conditions, although there are some nominal regulations governing activities such as the live release of bled crabs. These permit conditions are designed to reduce the potential for mortality and are based on the ASMFC's best management practices for the biomedical harvest, handling, transport, and release of horseshoe crabs. Existing permit conditions include but are not limited to: temperature controls during transport and storage; limits on time-out-of-water; limits on how full containers of horseshoe crabs may be; marking of bled horseshoe crabs to prevent re-bleeding more than once in a season; and post-bleeding live release to harvest area.

Penning of horseshoe crabs is a common practice in the biomedical fishery. This allows biomedical firms (or their associated dealer) to collect horseshoe crabs over a window of time and then provide these animals to the biomedical firms for bleeding in appropriate quantities and when they are staffed to process the animals. It may also be used post bleeding to timely place horseshoe crabs back in the water immediately prior to live release. While penning is not restricted, I have concerns about this activity as lethal and sub-lethal impacts not well understood, and consequently, best management practices are not well informed. Horseshoe crabs are susceptible to injury and mortality in these pens, particularly if the conditions are too dense or environmental conditions change (e.g., large rain event affecting salinity). To this point, DMF is aware of two mortality events in 2022 resulting from the penning of biomedical horseshoe crabs.

Historically, the Massachusetts biomedical fishery only involved one biomedical firm, Associates of Cape Cod. This firm sourced horseshoe crabs from biomedical harvesters (primarily hand harvesters), the rent-a-crab program, and other state sources. This past year (2022), a second firm—Charles River Labs—began to participate in the state's biomedical fishery. Charles River Labs is a longstanding Massachusetts-based biomedical company who was previously active in other biomedical fisheries along the Atlantic coast (e.g., South Carolina). This firm sourced horseshoe crabs from biomedical harvesters (both trawl and hand harvesters) but did not participate in the rent-a-crab program.

While the biomedical fishery is catch and release, there is some amount of mortality associated with it. The ASMFC uses a 15% mortality rate in the stock assessment, meaning they assume 15% of the total number of horseshoe crabs harvested for biomedical purposes will die as a result of the bleeding process.

The use of the rent-a-crab program has historically kept Massachusetts biomedical landings (and resulting mortality) at modest levels. However, with the addition of a second biomedical firm, which does not participate in the rent-a-crab program, caused biomedical landings to increase in 2022, with potential to increase further. While the 15% biomedical mortality rate is much less than the 100% mortality rate of the bait fishery, applying the 15% rate to a rapidly growing fishery could lead to substantial numbers of dead crabs.

In 2022, biomedical horseshoe crab landings approached 175,000 crabs. Using the 15% mortality figure, we can estimate approximate mortality at 26,250 horseshoe crabs post-bleeding in 2022. This was a sizeable increase in harvest and mortality from the biomedical fishery when compared to prior years. It was driven by increased demand for crabs and the second biomedical firm entering the fishery and being exclusively reliant on biomedical harvest to meet their demand. Under status quo management, I would expect biomedical landings to increase in 2023, as Charles River Labs will have the benefit of one year of experience in Massachusetts and both biomedical firms will be competing for horseshoe crabs starting at the beginning of the fishing season this spring.

There is also some level of mortality occurring prior to bleeding that is not being captured in our mortality estimates. This is the mortality that may occur as a result of harvest and penning. Trawling likely produces a higher pre-bleeding mortality rate than hand harvest given the differences in catch and handling practices (e.g., shells being broken from weight of catch in nets, dropped on deck, exposure to conditions at sea). This may be further exacerbated by the biomedical trawl fishery occurring into the early fall during molting when shells are softer and the animal is more vulnerable to physical damage. DMF is particularly concerned about these protentional sources of mortality given the above-stated 2022 mortality events due to penning and trawlers contributing more to biomedical harvest in recent years

There are also concerns regarding the sub-lethal impacts of both bleeding and penning. Penning and bleeding likely stress the animal and may negatively impact its reproductive capabilities during that year's spawning event. Therefore, if a horseshoe crab is removed from a spawning beach before it spawns, even if it were returned to the same beach during the spawning season, there exists uncertainty as to whether the animal would be able to successfully reproduce.

Significantly more research is warranted to study the lethal and sub-lethal impacts of the biomedical fishery. DMF intends to make horseshoe crab research a priority if additional resources can be obtained to support it.

Public Hearing Proposals

Horseshoe crabs are an important public resource that provide public health, economic, ecological, and cultural benefits. I am concerned about the potential for continued growth in the exploitation of this resource and the ability for us to capture a stock decline before it occurs, given the various uncertainties in science and management and the fact these are slow growing animals with localized populations.

Accordingly, I support taking a precautionary approach to managing this fishery by attempting to cap exploitation at near recent levels. That available data tends to suggest our horseshoe crab resource can withstand recent levels of exploitation, given total mortality has remained somewhat steady in recent years and we have not seen declining trends in our survey indices. Moreover, our state's horseshoe crab fishery is becoming subject to increasing public scrutiny and I want to manage this fishery in a more transparent way, so that other constituents may better understand how the fishery is managed and why. Absent these proposed management measures, I fear that total harvest and mortality of horseshoe crabs will continue to increase, which may possibly lead to depletion of this very valuable resource, and there will be more user group conflicts and escalations in tensions among the diverse constituent groups.

<u>Permitting</u>

Historically, DMF has issued a "bait dealer" permit to both the biomedical firms and the dealers accepting horseshoe crabs from biomedical harvesters on their behalf. This is a once-size-fits-all approach to permitting to accommodate this activity through an existing dealer permit type. To implement a more transparent and practical management program for the biomedical fishery, I am proposing to establish two new dealer permit types—a biomedical dealer permit and a biomedical processor permit.

The biomedical processor firm will authorize firms to process horseshoe crabs for biomedical purposes, including the bleeding of horseshoe crabs for LAL extraction. It will also allow the firm to purchase horseshoe crabs directly from a biomedical harvester and obtain horseshoe crabs from other approved sources (e.g., associated biomedical dealer, rent-a-crab program, and importation from out of state). These permits may be limited in issuance in any calendar year to prevent the uncontrolled proliferation of new biomedical harvest and prevent the use of satellite firms to gain additional access to horseshoe crabs.

The biomedical dealer permit will allow the named entity to purchase horseshoe crabs from an authorized biomedical harvest for sale to a biomedical processor. These dealer permits will be issued only to entities with an established relationship with a biomedical processor.

These new permits will replace the bait dealer permit type. If an entity has already purchased a bait dealer permit for the 2023 calendar year, we will issue this new permit free of charge this year. Moving forward, these permits will be reclassified as a type of wholesale dealer permit (rather than as a type of bait permit), as they authorize primary purchasing, resale, and processing. Note the existing permit fees set in ANF regulations for Bait Dealer and Wholesale Dealer permits are different, with the Bait Dealer permit having an annual fee of $65 for residents and $130 for non-residents and the Wholesale Dealer permit having an annual fee of $130 for residents and $260 for non-residents. As a result of this reclassification of the permit type, the annual permit fee for these entities will increase.

Conservation

The following sections address DMF's conservation proposals to enhance spawning protections and cap overall mortality at recent levels.

Spawning Closure

To protect horseshoe crab spawning, DMF has established a series of five-day lunar-based spawning closures around each new and full moon from April 16 – June 30. Although the timing of the closures varies annually based on the lunar calendar, typically about one-third of the days during this time-period are closed to harvest (i.e., there are approximately 25-closed days annually during this 75-day period). For 2023, there will be exactly 25-closed days with closures to occur from April 18 – April 22; May 3 – May 7; May 17 – May 21; June 2 – June 6; and June 16 – June 22.

Moving forward, I am proposing to replace these lunar-based closures with a blanket January 1 – May 31 closure to all horseshoe crab harvest. Given the late timing of this proposal and the anticipated rule making schedule, the implementation of this closure could be postponed until 2024 with the lunar closures remaining in effect for 2023. This blanket closure approach has been requested by conservation groups, including the Horseshoe Crab Conservation Association (see attached petition).

I prefer this closure approach for several reasons. First, it protects horseshoe crabs throughout the peak of the spawning event in May and prevents the harvest of pre-spawning crabs when they begin to stage nearshore for spawning and egg laying. Based on spawning beach survey data (i.e., observations of the presence of female spawning crabs), this closure will protect approximately 80% of all female spawning crabs from harvest both north and south of Cape Cod. Second, a blanket seasonal closure to all harvest is more enforceable than a periodic closure, providing for better compliance. Lastly, it allows for harvest to open in June once a large majority of spawning activity has occurred but when the resource is accessible to both hand harvesters and trawlers. The impact of the closure from January 1 through late April will be negligible given harvest is not occurring at this time of year.

The closure will also apply to all harvest, inclusive of both the biomedical and bait fisheries. The biomedical industry may seek an exemption to this closure, as they live release horseshoe crabs back to harvest areas after bleeding. However, I am generally not disposed to granting this exemption, as I have concerns about the lethal and sub-lethal impacts of penning and bleeding, and how these activities may negatively impact the animal's reproductive capacity during that year's spawning event. Given my preference for a precautionary approach, further research here is likely necessary to warrant such an exemption.

It is notable that closures through June 15 and June 30 will protect 95% and 100% of all female spawning crabs, respectively. However, I do not think extending this closure into June is necessary at this time.

More prolonged closures would substantially constrain harvest opportunities for all user groups, particularly hand harvesters, and possibly result in the state's fishery not meeting all of the demand from the bait and biomedical industries. Given our horseshoe crab stock is currently in good condition, I feel it is reasonable to allow harvest during June as spawning activity wanes and the resource is available to all fishery participants.

Biomedical Processor Quota
As stated above, overall biomedical harvest and mortality is not currently capped. The presence of a second biomedical firm in 2022 demonstrated to DMF how quickly harvest and mortality may increase in this sector if unconstrained. It is my perspective that recent levels of harvest and mortality are likely sustainable, given our available population indices are generally positive with current rates of exploitation. Accordingly, I am seeking to cap harvest in the biomedical fishery to 200,000 horseshoe crabs annually. Once this quota is reached, the biomedical fishery will close for the calendar year. During a quota closure, biomedical processors will still be able to access horseshoe crabs from other approved sources (e.g., rent-a-crab program; other states).

This 200,000 horseshoe crab quota is slightly above harvest in 2022 (~175,000 crabs). This recognizes that Charles River Labs' operation was not fully operable at the start of the season and allows for some additional growth to provide access to this important public health commodity. With a 200,000 horseshoe crab quota, DMF expects mortality would approximate 30,000 horseshoe crabs. This estimate is based strictly on applying 15% post-bleeding mortality figure used by the ASMFC to the annual quota. However, mortality could be higher because that 15% rate does not consider potential sources of pre-bleeding mortality that occur during harvest, handling, and penning.

The establishment of a quota in the biomedical fishery may result in derby style approach to harvest and processing activities, as biomedical firms compete to access as much of the quota as they can. I am concerned this will result in poorer handling practices and increased reliance on penning animals and penning animals longer periods of time. Such changes will likely increase mortality and injury to the animals. I want to avoid this situation, so I am considering allocating the available quota evenly to each of the biomedical processors. This will allow each firm to utilize their access to the biomedical quota in a manner that meets their business practices and prevents a derby approach. This approach may also be untenable should another biomedical firm begin to operate in Massachusetts fishery, which is why I have proposed to potentially limit access to the biomedical processor permit.

Bait Quota Reduction
I am also proposing to reduce the bait quota by 25,000 crabs from 165,000 crabs to 140,000 crabs. This caps bait harvest at just above the 10-year mean and similar to the harvest level this past year (2022). Part of this reduction is to offset expected increasing mortality from the biomedical sector. This is not an animal-for-animal payback of expected mortality should the 200,000 horseshoe crab biomedical quota be adopted, but rather considers expected total mortality moving forward and total mortality figures in recent years (which are confidential).

I feel further reducing the bait quota here is warranted given recent performance of the bait fishery and my preference for a precautionary approach to managing this resource. Moreover, there are anecdotal reports to DMF that bait harvest is currently sufficient to meet local demand. I do not expect this will change given the current status of the state's channeled whelk resource and the likelihood that participation (number of fishermen) and effort (number of pot hauls) will likely continue at current levels (or wane) given anticipated stock conditions for the foreseeable future. Additionally, I am under the impression that other states are beginning to address the poor condition of whelk resources in their waters and in the coming years we may see new management initiatives and reduced whelk fishing effort along the coast. If this is the case out-of-state demand may begin to wane in the coming years.

Trip Limits

The following proposals address bait fishery trip limits. This responds to the public comment received at the December 13 meetings and informal conversations between staff and bait fishers and bait dealers. Additionally, it considers address potential loss of bait harvest due to spawning closures, interest in enhancing the profitability and efficiency of the inshore trawl fishery, and maintaining quota into the early fall when summer flounder trawling is likely still occurring to reduce potential regulatory discarding.

At present, I am not proposing to change the trip limit for the biomedical fishery (1,000 horseshoe crabs). However, should biomedical processors or dealers submit public comment and advocate that a trip limit change is warranted, then I will consider it in my final recommendation to the MFAC.

Bait Fishery Trip Limits

For the bait fishery, I am proposing to increase the regulatorily set trip limit for all permit holders up to 500 horseshoe crabs. The current trip limit is 300 horseshoe crabs for mobile gear and 400 horseshoe crabs for other gear types.

The rationale for the bait fishery trip limit change is two-fold. First, it will recoup landings lost by implementing a January 1 – May 31 closure. May is the peak fishing season for the hand harvest fishery and closing this period to enhance spawning protections will undoubtedly reduce bait fishery landings over the course of the year. With our goal of maintaining bait fishery landings at the 140,000 crab threshold, then we need to accommodate additional landings at other times of the year when the fishery is open. Second, I am concurrently proposing several changes to the commercial summer flounder fishery to enhance summertime access to the quota, including a potential weekly aggregate program or trip limit increases. These changes are likely to increase the trawl fishing effort on a per trip basis (i.e., tows per trip) even if it may not result in a net increase in weekly effort (i.e., tows per week). Accordingly, if these amendments to the summer flounder fishery are approved and enacted, increasing trawler limits for horseshoe crabs is appropriate to prevent regulatory discarding, particularly as I will not be accommodating horseshoe crabs in a weekly aggregate program (i.e., daily trip limits would apply).

I am also willing to consider starting the trip limit out at a lower level (particularly for trawlers) and then building in an automatic trip limit increase at a date certain should a certain quantity of quota remain. We do this for a variety of our quota managed finfish species (e.g., summer flounder, black sea bass) in order to stretch the quota out through the summer period and then utilize whatever remains at the end of the season before inshore fishing conditions worsen and catch rates plummet. This may be of less interest generally for the bait fishery, as catch is frequently frozen for sale at a later date. However, it may be beneficial to the trawl fishery to keep the horseshoe crab quota open throughout the early fall when inshore trawl fishery is active.

Letters of Authorization for Non-Permitted Trawlers

There are a small number of trawlers who are active in the summertime inshore trawl fishery south of Cape Cod who do not hold a horseshoe crab endorsement. For many years, to meet bait demand and demand from the rent-a-crab program, DMF issued Letters of Authorization (LOAs) to these draggers to allow them to retain the same trip limit of horseshoe crabs as a permit holder. This was always a point of contention among certain fishers who held a horseshoe crab endorsement and felt it lessened the benefits obtained by this permit and negatively impacted the equity associated with their capital investment in the permit.

This issue came to a head in 2019 when the bait quota was taken for the first time and the fishery was closed on September 1 when the summer flounder trawling was still occurring in earnest inshore, forcing

participants to discard their horseshoe crab catch. As a result, DMF did not re-issue these LOAs and instead adopted an open entry trip limit (75-crabs) for these draggers. Note that in 2021 and 2022 we did issue LOAs during the late summer to increase the trip limit for all remaining trawl participants to utilize the quota to meet bait and rent-a-crab demands. This resulted in DMF establishing commensurate trip limits for both permit holders and non-permit holders alike.

As we have discussed on numerous occasions, there are a variety of economic, social, and environmental issues affecting the inshore trawl fleet. Effort and participation in the inshore fishery south of Cape Cod has decreased by about 50% over the past 10-years. This worsens already difficult situations affecting commercial fishing infrastructure (e.g., dockage, availability of buyers). As Director, I am dedicated to trying to preserve this important inshore fleet (and its contributions to the state's seafood economy) and want to take reasonable and calculated steps to enhance the efficiency and profitability of its participants. To this end, one area I am investigating is ways to make active operations more whole so that they can retain a greater portfolio of catch. The MFAC's Permitting Sub-Committee has met to discuss potential permitting solutions and will meet again soon to deliberate on potential transferability solutions.

As a stop gap, I am considering reissuing LOAs in 2023 to draggers who have documented summer flounder and horseshoe crab landings in the past three years. Participation in this trawl fishery varies from year to year, but based on recent activity, I suspect there may be between two and five potentially eligible vessels. Given potential concerns about quota utilization at a reduced 140,000 crab quota, I would also consider holding off on issuing these LOAs until a date certain or rescinding the LOA once a certain proportion of the quota is harvested.

Reporting

Currently, as a condition of the commercial fishing permit, all commercial fishers are required to report their catch on a monthly trip level basis with the prior month's report due by the 15th of the next month. These reports may be submitted electronically or on paper forms. Given the emerging management challenges and concerns related to this commercial fishery, as well as the new management measures proposed here (e.g., biomedical quota), more timely reporting is necessary. Accordingly, I am proposing to require all harvesters in the horseshoe crab fishery—both biomedical and bait—report electronically on a daily basis. Given the current rule making timeline, this will not go into effect until 2024, which will provide additional time for outreach and education. Note, it is a strategic DMF goal to implement electronic daily reporting across our commercial fisheries over the next few years, particularly now that the technology is accessible via smart phones.

Biomedical Fishery Permit Conditions

At present, DMF has very few regulations governing the performance of the biomedical fishery. Rather, DMF has relied on its authority to condition permits to manage this fishery. This was done to address the rather nuanced and complicated aspects of the biomedical fishery. Moreover, it allowed DMF to amend these controls in a timely manner, if necessary. However, as the biomedical fishery is maturing, it is appropriate to more deliberately and transparently manage this fishery. Accordingly, I am moving to codify many of the permit conditions affecting biomedical harvesters, biomedical dealers, and biomedical harvesters as regulation. DMF will retain the authority to condition permits and will continue to condition permits as necessary for conservation and management. This includes the following:

a. Prohibit biomedical harvesters from possessing and harvesting horseshoe crabs for purposes other than sale to a biomedical dealer or processor. Including preventing individuals from holding both the biomedical harvest permit and the bait harvest permit.
b. Require biomedical processors to mark all processed horseshoe crabs with a distinctly colored mark whose shape changes annually and prohibit the recapture of any horseshoe

crabs by biomedical harvesters with that year's mark and the and rehandling and reprocessing of any horseshoe crab by biomedical dealers and processors with that year's mark.

c. Allow for penning of biomedical crabs by biomedical dealers and biomedical processors subject to permit conditions as necessary for conservation and management.
d. When biomedical dealers and processors are handling horseshoe crabs, require the crabs remain moist; if stored in containers that the containers are no more than 2/3 full; maintain temperature control in transit (50°F to 60°F) and during storage at the biomedical facility (ambient air temperature not to exceed 70°F); and prohibit horseshoe crabs from being out of the water for a period longer than 36 hours.
e. Require horseshoe crabs from different sources be segregated to ensure compliance with live-release standards.
f. Require all bled crabs to be live released by the biomedical dealer, biomedical processor, or a vessel under their employ. All hand harvested horseshoe crabs must be returned to the designated shellfish growing area from where they were harvested. All trawl harvested horseshoe crabs must be returned to the body of water adjacent to where they were harvested, which will be further specified by permit condition based on the individual operation and in order to minimize the potential for recapture during the same year.
g. For biomedical trawlers, limit tow length to 30 minutes with locked winches, require all harvested crabs be retained in in containers actively fed by sea water, and prohibit containers from being more than 2/3 full.
h. Authorize biomedical processors to obtain crabs from bait dealers, as part of the so-called "rent-a-crab" program and from other states provided they were lawfully harvested within that state.

Attachments

ASMFC's 2019 Stock Assessment Overview
January 9, 2023 Petition from Horseshoe Crab Conservation Association

Figure 1. Horseshoe Crab Stock Regions

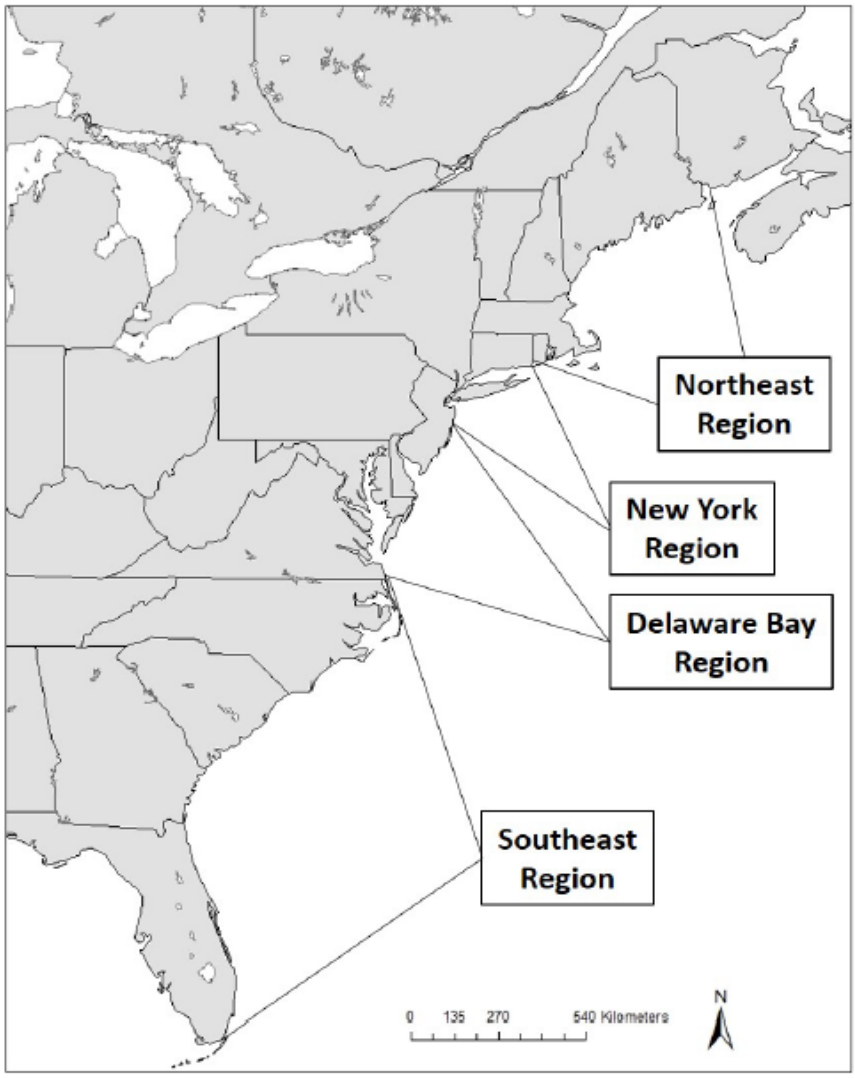


Figure 2. Horseshoe Trawl Survey North of Cape Cod –
Stratified Mean Number of Horseshoe Crabs Per Tow

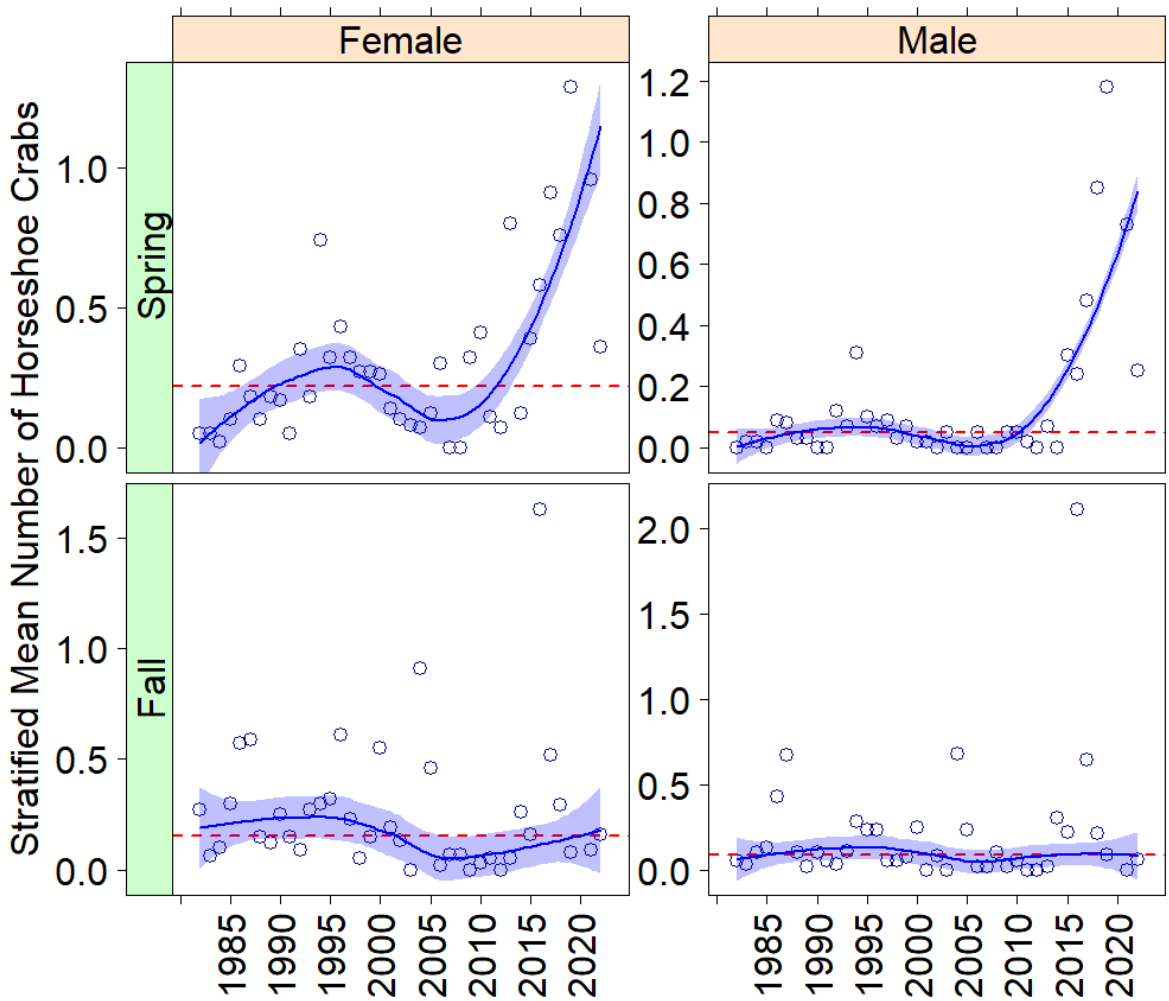


Figure 3. Horseshoe Trawl Survey North of Cape Cod –
Stratified Mean Number of Horseshoe Crabs Per Tow

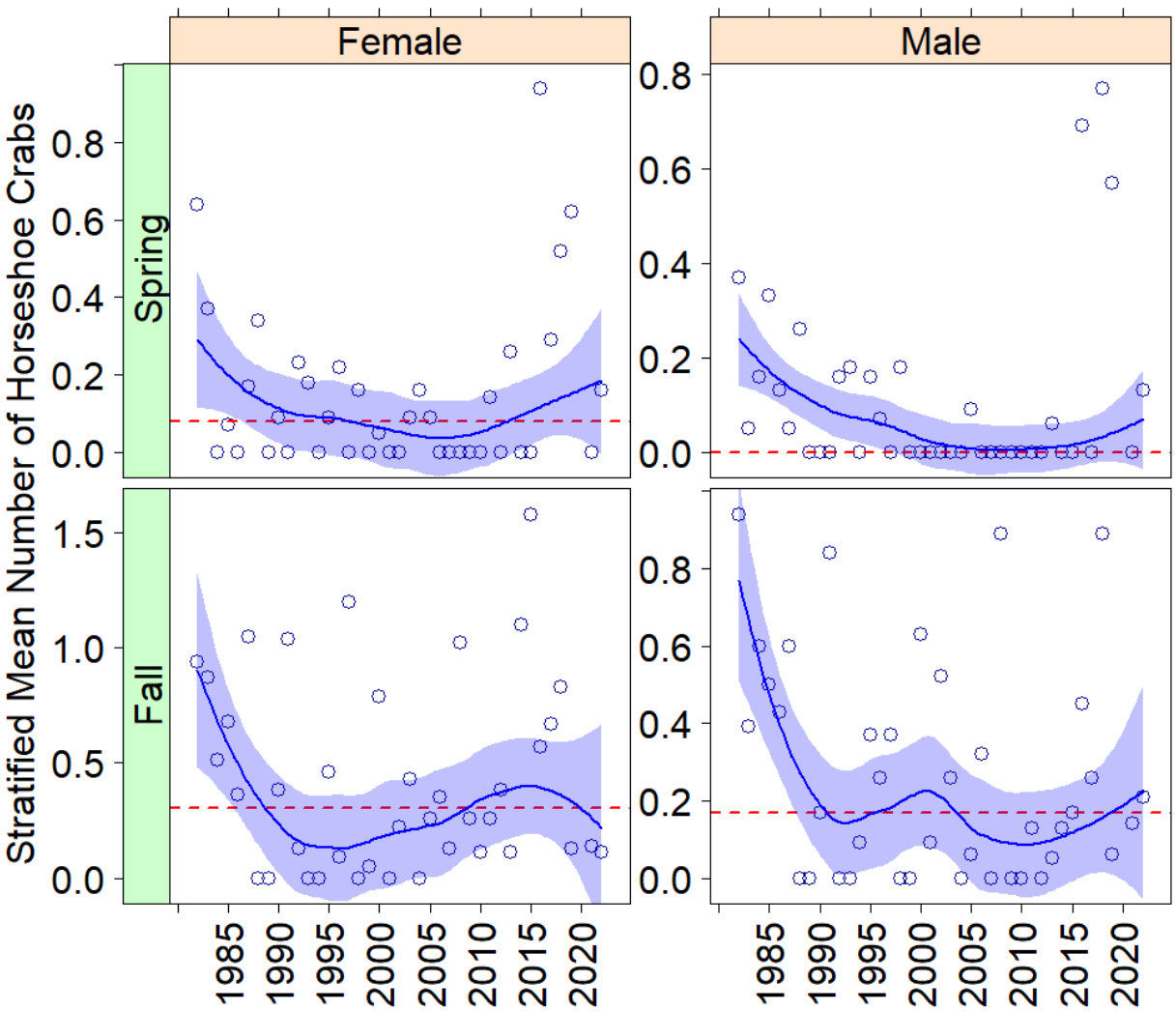


Figure 4. Horseshoe Trawl Survey South of Cape Cod –
Proportion of Tows with Horseshoe Crabs

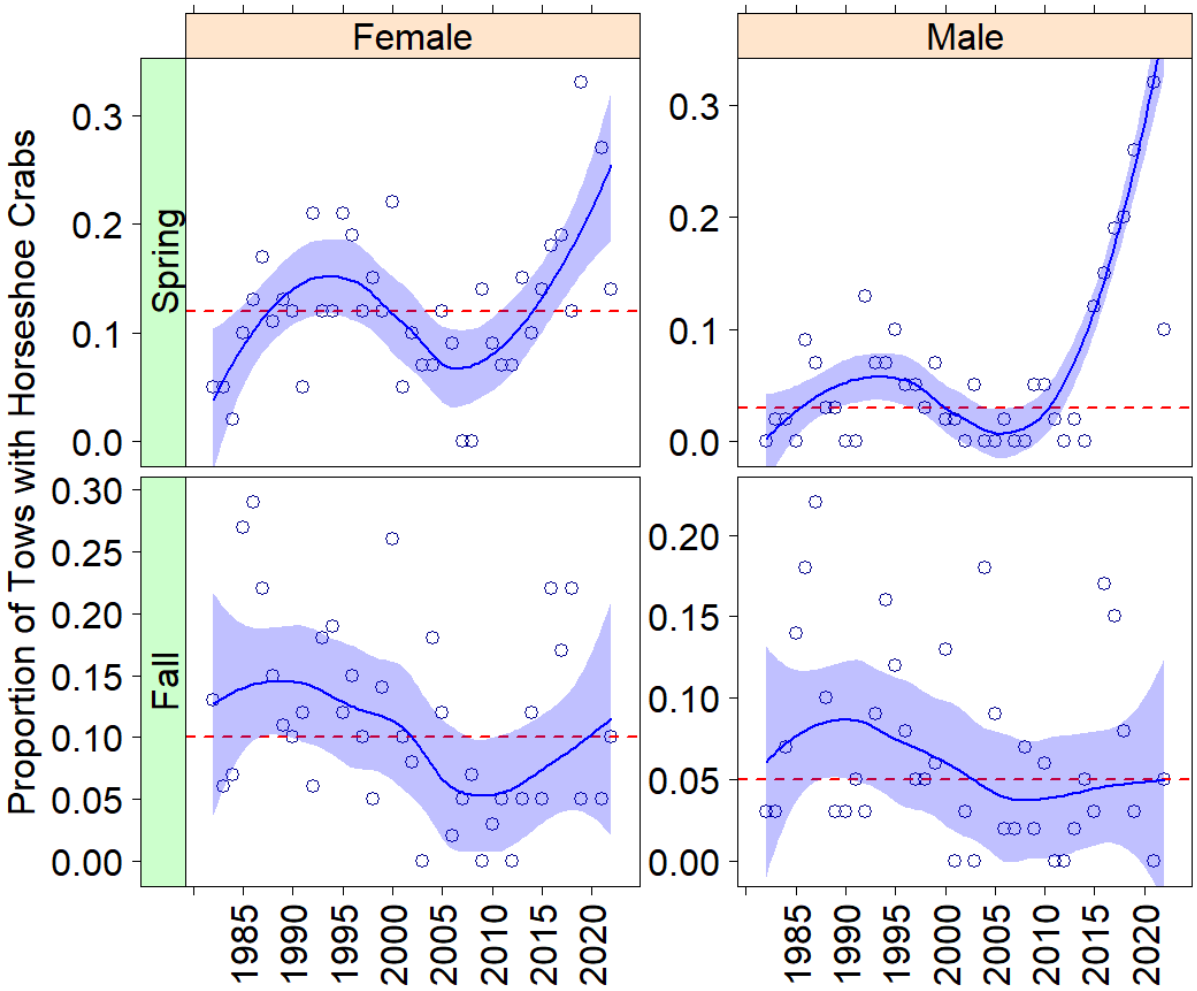


Figure 5. Horseshoe Trawl Survey North of Cape Cod –
Proportion of Tows with Horseshoe Crabs

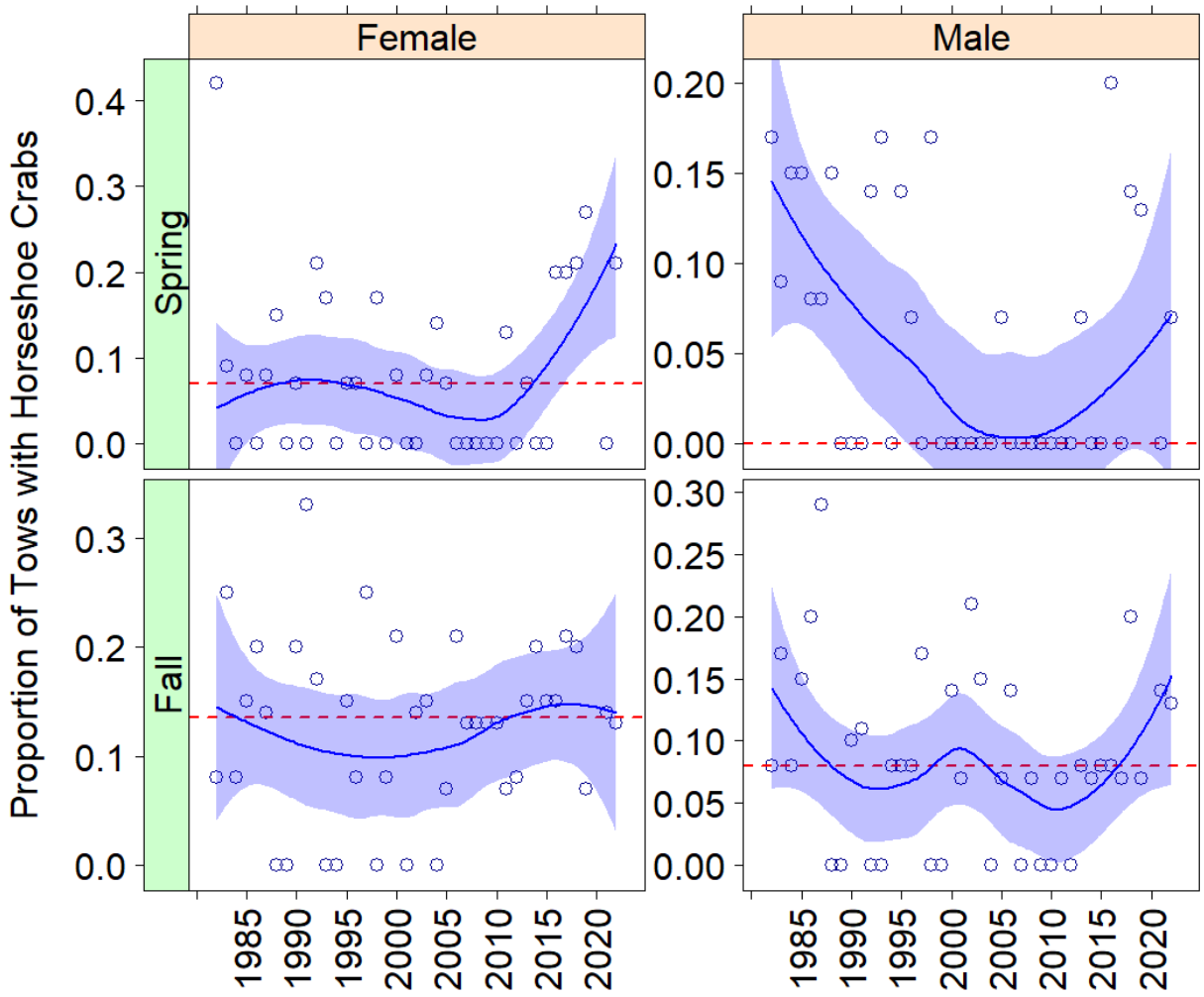
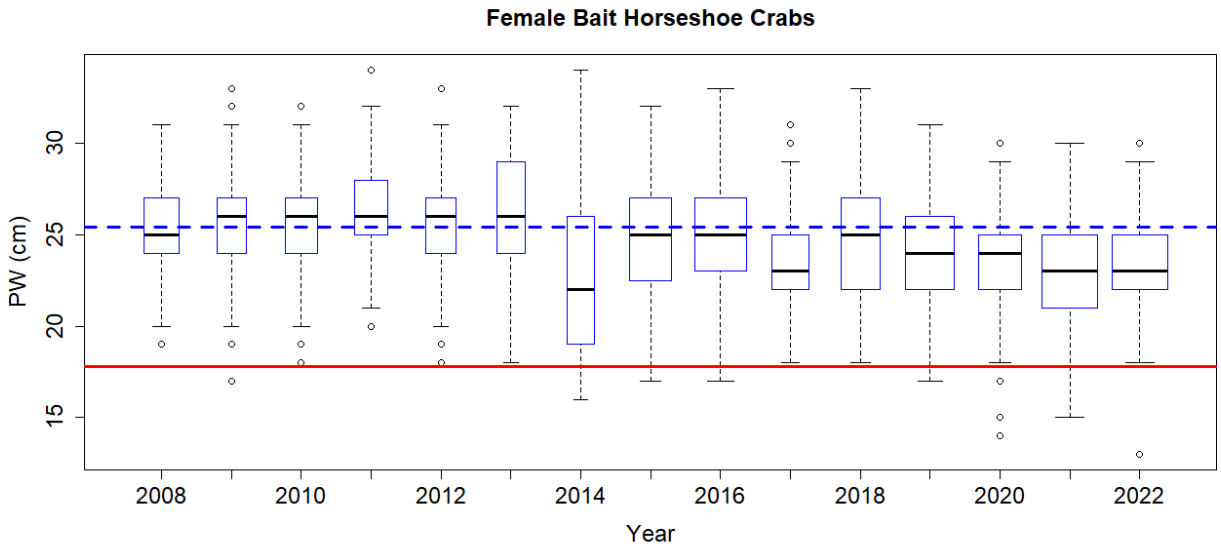


Figure 6. Spawning Beach Survey Trends for 2021 Compared to Median

Beach	Region	Time of Day	2021 vs Median	10-year trend	5-year trend
Duxbury	Cape Cod Bay	Day	equal	mixed	decreasing
Duxbury	Cape Cod Bay	Night	equal	mixed	neutral
Long Beach	Cape Cod Bay	Day	equal	N/A	N/A
Long Beach	Cape Cod Bay	Night	above	N/A	N/A
Millway	Cape Cod Bay	Day	above	mixed	increasing
Millway	Cape Cod Bay	Night	above	mixed	increasing
Long Pasture	Cape Cod Bay	Day	above	mixed	increasing
Long Pasture	Cape Cod Bay	Night	below	N/A	N/A
Sanctuary Beach	Cape Cod Bay	Day	below	decreasing	increasing
Indian Neck	Cape Cod Bay	Day	above	mixed	increasing
Indian Neck	Cape Cod Bay	Night	above	mixed	increasing
Great Island	Cape Cod Bay	Day	above	decreasing	increasing
Priscillas Landing	Outer Cape Cod	Day	above	increasing	increasing
Marsh 2-3	Outer Cape Cod	Day	above	increasing	increasing
Erica's Beach	Outer Cape Cod	Day	above	decreasing	increasing
Bass River	Nantucket Sound	Day	above	N/A	mixed
Bass River	Nantucket Sound	Night	below	N/A	N/A
Warrens Landing	Nantucket Sound	Day	above	increasing	increasing
Warrens Landing	Nantucket Sound	Night	above	increasing	increasing
Tashmoo	Nantucket Sound	Day	above	increasing	increasing
Tashmoo	Nantucket Sound	Night	above	increasing	increasing
Tahanto	Buzzards Bay	Day	equal	mixed	neutral
Tahanto	Buzzards Bay	Night	above	decreasing	increasing
Swifts Beach	Buzzards Bay	Day	equal	decreasing	neutral
Swifts Beach	Buzzards Bay	Night	below	decreasing	decreasing

Figure 7. DMF Market Sampling for Average Female Bait Crabs Prosomal Width by Year from 2008 - 2022



ASMFC Stock Assessment Overview: Horseshoe Crab

Introduction

This document summarizes the 2019 benchmark stock assessment for horseshoe crab. The horseshoe crab assessment was evaluated by an independent panel of scientific experts through the Atlantic States Marine Fisheries Commission's External Peer Review process. The horseshoe crab assessment represents the most recent and best information on the status of the coastwide horseshoe crab stock for use in fisheries management.

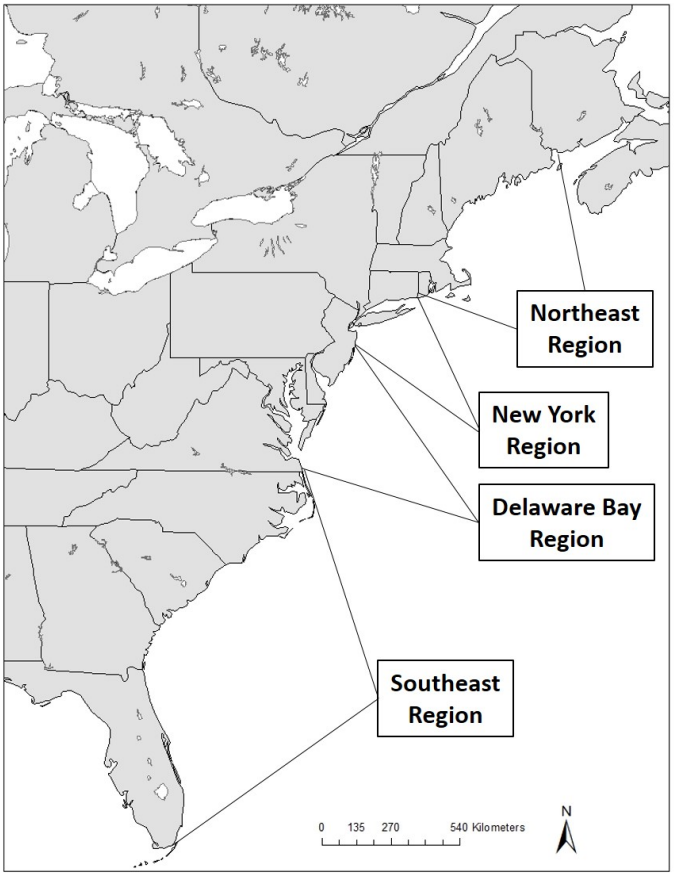
Management Overview

Horseshoe crab fisheries are managed solely by the Atlantic States Marine Fisheries Commission (ASMFC) through the 1998 Horseshoe Crab Fishery Management Plan (FMP). Addendum I (2000) to the FMP established a coastwide, state-by-state annual quota system to further reduce horseshoe crab landings. Addendum II (2001) established criteria for voluntary quota transfers between states.

Addendum III (2004) sought to further conserve horseshoe crab and migratory shorebird populations of red knot in and around the Delaware Bay by reducing horseshoe crab harvest quotas, implementing seasonal bait harvest closures in New Jersey, Delaware, and Maryland, and revising monitoring components for all jurisdictions. Addendum IV (2006) further limited bait harvest in New Jersey and Delaware to 100,000 crabs (male only) and required a delayed harvest in Maryland and Virginia. The provisions of Addendum IV were extended by Addendum V, and VI extended Addendum IV's measures through the 2013 fishing season.

Addendum VII (2012) implemented the Adaptive Resource Management (ARM) Framework for use during the 2013 fishing season and beyond. The Framework considers the abundance levels of horseshoe crabs and shorebirds in determining the optimal harvest level for horseshoe crabs of Delaware Bay-origin. Since initial implementation in 2013, the ARM Framework has recommended a 500,000 male-only crab harvest in every year.

Based on tagging and genetic studies and the management of the species, the coastwide horseshoe crab stock is assessed as four populations: the Northeast, New York, Delaware Bay and Southeast regions.



What Data Were Used?

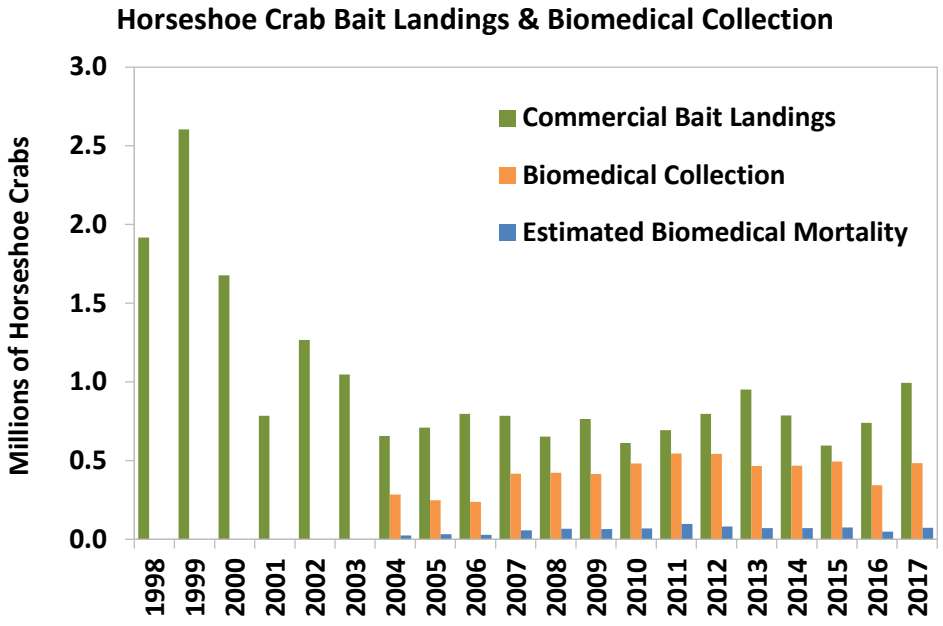
The horseshoe crab assessment used both fishery-dependent and independent data, as well as information about horseshoe crab biology and life history. Fishery-dependent data come largely from the commercial bait fishery and estimates of use by the biomedical industry, while fishery-independent data are collected through scientific research and surveys.

Life History

Horseshoe crabs are a long-lived, highly fecund species (meaning they produce a lot of eggs); however, they are subject to high egg and larval mortality due to predation and unfavorable environmental conditions. Horseshoe crabs breed in late spring on Atlantic coast beaches, laying eggs in nests buried in the sand. Larvae typically hatch from the eggs within 2 to 5 weeks, then settle within a week of hatching and begin molting. Juvenile crabs initially remain in intertidal flats, near breeding beaches. Older juveniles move out of intertidal areas to deeper bay and shelf waters and then return as adults to spawn on beaches in the spring. Adults overwinter in the bays or shelf waters. Horseshoe crabs are thought to mature around 10 years of age and may live over 20 years. Horseshoe crabs undergo stepwise growth by periodically shedding their shells (molting) until maturity, with females typically maturing later and attaining larger sizes than males.

Commercial Data

Since 1998, states have been required to report annual landings to ASMFC through the compliance reporting process and to the Atlantic Coastal Cooperative Statistics Program (ACCSP) Data Warehouse. Landings used in this assessment for 1998 through 2017 were validated by state agencies through ACCSP. Reported landings data show that commercial harvest of horseshoe crabs was high in the late 1990s, declined in the early 2000s, and has been relatively stable since 2004. The majority of bait harvest comes from the Delaware Bay Region, followed by the New York, New England, and Southeast Regions. The bulk of commercial horseshoe crab bait landings are caught by trawls, hand harvests, and dredges.

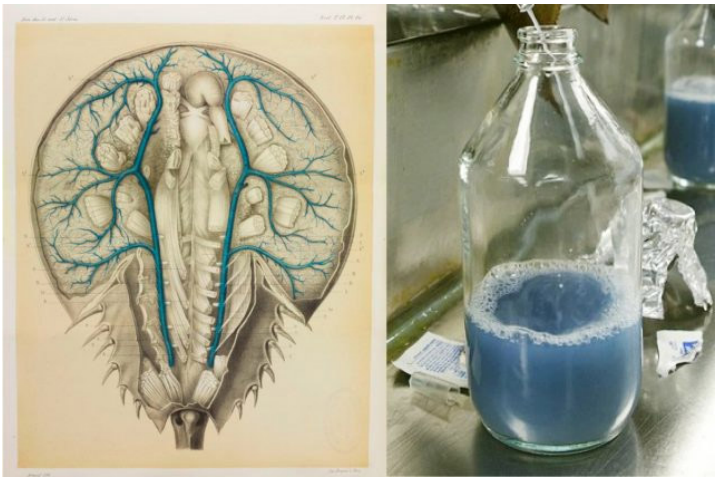


Horseshoe crabs are also collected by the biomedical industry to support the production of Limulus amebocyte lysate (LAL), a clotting agent in horseshoe crab blood cells that is used in the detection of pathogens in health patients, drugs and intravenous devices. Blood from the horseshoe crab is obtained by collecting and

Please note the following details regarding biomedical collection numbers:

* Annually reported biomedical collection numbers include all crabs brought to bleeding facilities except those harvested as bait and counted against state quotas.
* Most collected biomedical crabs are returned to the water after bleeding; a 15% mortality rate is estimated for all bled crabs.

extracting a portion of their blood. As required by the FMP, most crabs collected and bled by the biomedical industry are released alive to the water from where they were collected. However, a portion of these crabs die from the procedure. Crabs harvested for bait are sometimes bled prior to being processed and sold by the bait industry; these crabs are counted against the bait quota. Biomedical use has increased since 2004, when reporting began, but has been fairly stable in recent years. Previous assessments and management documents have applied a mortality rate of 15% to the number of horseshoe crabs bled and released alive to estimate the number of crabs that are presumed dead as a result of the capture and bleeding process. This assessment maintains the 15% mortality rate based on an updated analysis of available literature on this topic.



On the left, venous system of the horseshoe crab from Milne-Edwards's *Recherches sur l'anatomie des Limules* – American Museum of Natural History. On the right, extracted blue blood from horseshoe crabs (Mark Thiessen – National Geographic)

Horseshoe crabs are also encountered in several other commercial fisheries. Discard mortality occurs in various dredge, trawl and gillnet fisheries and may vary seasonally with temperature, impacting both mature and immature horseshoe crabs. However, the actual rate of discard mortality is unknown. Commercial discards were estimated for the Delaware Bay region as part of this assessment with data from the NOAA Fisheries Northeast Fisheries Science Center's Northeast Fisheries Observer Program. Estimates indicate a significant amount of horseshoe crabs are captured and discarded in other fisheries, possibly on the same scale as the bait fishery, although substantial uncertainty is associated with the estimates and quantifying discards will require further work in future assessments.

Data Confidentiality

The stock assessment was conducted with the inclusion of biomedical data on a regional basis, which are confidential. The report for peer review included confidential data but these data were redacted for the Technical Committee and public report. Biomedical data are not confidential at the coastwide level. Confidential data are data such as commercial landings or biomedical collections that can be identified to an individual or single entity. Federal and state laws prohibit the disclosure of confidential data, and ASMFC abides by those laws. In determining what data are confidential, most agencies use the "rule of 3" for commercial catch and effort data. The "rule of 3" requires three separate contributors to fisheries data in order for the data to be considered non-confidential. This protects the identity of any single contributor. In some cases, annual summaries by state and species may still be confidential because only one or two dealers process the catch. Alternatively, if there is only one known harvester of a species in a state, the harvester's identity is implicit and the data for that species from that state are confidential.

In this assessment, although three biomedical facilities operate in the Delaware Bay region, these data are confidential because only two facilities operate outside this region. Therefore, if Delaware Bay regional collections were released, those with knowledge of confidential collections (such as facility employees) for one of the facilities outside of the Delaware Bay region would, through subtraction from the coastwide total, also know collections for the other facility.

Fishery-Independent Surveys

The horseshoe crab assessment used 17 fishery-independent surveys to characterize trends in abundance of horseshoe crab. Two surveys were located in the Northeast region, 4 in the New York region, 7 in the Delaware Bay region, and 5 in the Southeast region.

What Models Were Used?

Tagging data from the U.S. Fish and Wildlife Service horseshoe crab database were explored by region to estimate survival. The highest survival rates were in the Delaware Bay and coastal Delaware-Virginia regions. The lowest survival rates were in coastal New York-New Jersey and the Southeast.

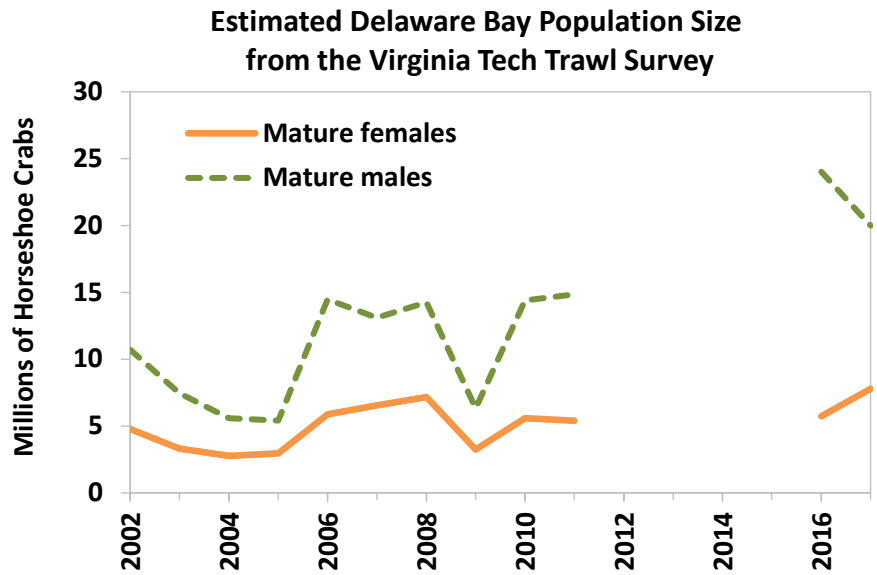
A trend analysis was used to assess regional and coastwide stocks and an additional stage-based model using pre-recruits and full recruits were used to assess the Delaware Bay region. For the trend analysis, 1998 was used as the benchmark year for comparison of survey trends since it was the first year of FMP implementation. Not all surveys were used in each assessment method. Traditional age-based methods could not be used because there is no technique available to measure the ages of horseshoe crabs.

Coastwide and Regional Trend Analysis

Autoregressive Integrated Moving Average (ARIMA). A smooth trend was generated for each survey, then the probability that the most recent year's survey value had dropped below the 1998 level was estimated (see table on next page). In the Northeast Region, 1 out of 2 surveys were likely less than the 1998 reference point. In the New York Region, 4 out of 4 surveys were likely less than the 1998 reference point. In the Delaware Bay Region, 2 out of 5 surveys were likely less than the 1998 reference point. Finally, in the Southeast Region, no survey was below the 1998 reference point. Coastwide, 7 out of 13 surveys were likely less than the 1998 reference point.

Delaware Bay Region Analysis

Catch multiple survey analysis. The catch multiple survey analysis (CMSA) estimated Delaware Bay stock dynamics from 2003-2018 by dividing the population into 1 of 2 life stages (pre-recruits and full recruits to the fishery). It then tracked trends in the relative abundance of these two stages in the Virginia Tech Benthic Trawl Survey and one-stage abundance indices from the New Jersey Ocean Trawl and Delaware Adult Trawl Surveys. The model included commercial bait harvest, regional confidential biomedical data and commercial discard estimates. The CMSA indicated adult abundance in the Delaware Bay was stable from 2003-2012 and then began increasing considerably in the past few years. This finding is consistent with stock rebuilding due to a period of significantly reduced commercial landings and tight management controls on the fishery beginning in the early 2000s in this region. The results of the model are considered confidential since they included regional biomedical data, but sensitivity runs indicated the mortality attributed to biomedical collection does not have a significant effect on population estimates or fishing mortality.



The Peer Review Panel supported the CMSA as a stock assessment method for horseshoe crab in the Delaware Bay, but did not approve the reference point developed by the Stock Assessment Subcommittee for determining overfished and overfishing status to compare with the model output. Regardless, the Panel indicated population estimates from the CMSA do represent the best current estimates and the ARM Committee should consider using the estimates in the Framework.

What is the Status of the Stock?

To date, no overfishing or overfished definitions have been adopted for management use. For this assessment, biological reference points were developed for the Delaware Bay region horseshoe crab population although not endorsed by the Peer Review Panel for use in management. Stock status was determined on the coastwide and regional stock levels based on the results of the ARIMA and in comparison to similar analysis in past assessments.

Stock status was based on the percentage of surveys within a region (or coastwide) having a >50% probability of the final year being below the ARIMA reference point. **"Poor"** status was >66% of surveys meeting this criterion, **"Good"** status was <33% of surveys, and **"Neutral"** status was 34 – 65% of surveys. Based on this criteria, stock status for the Northeast region was neutral; the New York region was poor; the Delaware Bay region was neutral; and the Southeast region was good. Coastwide, abundance has fluctuated through time with many surveys decreasing after 1998 but increasing in recent years. The coastwide status includes surveys from all regions and indicates a neutral trend, likely due to positive and negative trends being combined.

Applying these stock status criteria to summary ARIMA results from the 2009 benchmark assessment and 2013 assessment update gives a general idea of how status has changed through time. The stock status of the Delaware Bay and Southeast Regions have remained consistently neutral and good, respectively, through time. The status of the Northeast region has changed from poor to neutral. The status of the New York region has trended downward from good, to neutral, and now to poor. These trends should be viewed with caution because the number of surveys in each region has changed in the current assessment and the index values have changed due to a change in methods for developing indices.

Number of Surveys Below the Index-based 1998 Reference Point in the Terminal (Final) Year of ARIMA Model

Region	2009 Benchmark	2013 Update	2019 Benchmark	2019 Stock Status
Northeast	2 out of 3	5 out of 6	1 out of 2	Neutral
New York	1 out of 5	3 out of 5	4 out of 4	Poor
Delaware Bay	5 out of 11	4 out of 11	2 out of 5	Neutral
Southeast	0 out of 5	0 out of 2	0 out of 2	Good
Coastwide	7 out of 24	12 out of 24	7 out of 13	Neutral

Data and Research Needs

Horseshoe crab assessments would be greatly improved by better characterization of commercial discards and resulting mortalities, as well as fishery-independent surveys and landings by fishery, sex, and life stage. Expanding data collection and analysis of current fishery-independent surveys and implementing new surveys that target horseshoe crabs throughout their full range would reduce uncertainty about horseshoe crab stock status. Further development of the CMSA and reference points coastwide as well as considering revisions to the ARM Framework in Delaware Bay are high priorities that will require additional data collection and modeling efforts.

Whom Do I Contact For More Information?

Atlantic States Marine Fisheries Commission
1050 N. Highland Street
Arlington, VA 22201
703-842-0740
info@asmfc.org

Glossary

Adaptive Resource Management (ARM): a structured, iterative process for decision making in the face of uncertainty whereby predictive population or ecosystem models are regularly updated with new information from scientific monitoring programs and associated management plans are adjusted accordingly.

Autoregressive Integrated Moving Average (ARIMA): a data analysis method that generates smooth trends in abundance indices and estimates the probability that an index has dropped below a specified level.

Catch multiple survey analysis (CMSA): a stock assessment method that divides the population into two or more life stages, then uses relative catch of animals in those stages within multiple surveys over time to estimate population abundance and fishing mortality.

References

ASMFC. 2019. 2019 Horseshoe Crab Benchmark Stock Assessment and Peer Review Report. ASMFC, Arlington, VA. 316 pp.

ASMFC. 2013. 2013 Horseshoe Crab Stock Assessment Update. ASMFC, Arlington, VA. 72 pp.

ASMFC. 2009. Guide to Fisheries Science and Stock Assessments. Arlington, VA. http://www.asmfc.org/uploads/file/GuideToFisheriesScienceAndStockAssessments.pdf

ASMFC. 2009. Horseshoe Crab Stock Assessment for Peer Review: No. 09-02 (Supplement A). ASMFC, Washington D.C. 122pp.

Delaware Bay Adaptive Resource Management Working Group. 2009. A Framework for Adaptive Management of Horseshoe Crab Harvest in the Delaware Bay Constrained by Red Knot Conservation. 81 pages.

Horseshoe Crab Conservation Association
P.O. Box 2334
Orleans, MA 02653-2334

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

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.

For information contact:
Paul Ward at
wardpj@aol.com

Commercial Horseshoe Crab Rules

Proposals

1. Permitting.
   a. Establish a new biomedical horseshoe dealer permit.
   b. Establish a new biomedical processor dealer permit. This permit may be limited in issuance.
2. Conservation.
   a. Adopt a January 1 – May 31 closure to all horseshoe crab harvest and rescind the existing five-day closures around each new and full moon from mid-April through June.
   b. Establish an annual processor quota for the biomedical fishery of 200,000 horseshoe crabs. This quota will be allocated evenly among biomedical processors.
   c. Reduce the bait quota by 25,000 horseshoe crabs from 165,000 to 140,000 horseshoe crabs.
3. Bait Fishery Trip Limits
   a. Consider increasing the trip limits for all permitted bait harvesters up to 500 crabs. Current limits are 300 crabs for permitted trawlers and 400 crabs for permitted hand harvesters.
   b. Consider re-issuing Letters of Authorization to certain mobile gear fishers who do not hold a horseshoe crab permit to land a full trip limit of horseshoe crabs, not the 75-horseshoe crab incidental limit.
4. Reporting. Beginning in 2024, require daily electronic reporting for all bait and biomedical harvesters.
5. Permit Conditions. Adopt certain existing permit conditions affecting biomedical harvesters, biomedical dealers, and biomedical processors in regulation.

The Commonwealth of Massachusetts
Division of Marine Fisheries
251 Causeway Street, Suite 400, Boston, MA 02114
p: (617) 626-1520 | f: (617) 626-1509
www.mass.gov/marinefisheries

MEMORANDUM

TO: Marine Fisheries Advisory Commission
FROM: Daniel McKiernan, Director
DATE: February 8, 2023
SUBJECT: Commercial Menhaden Fishery Proposal for Public Hearing

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Overview
I intend to take to public comment a suite of adjustments to the state's commercial menhaden fishery regulations for implementation this fishing year. This proposal responds to revisions of the interstate fishery management plan and aims to improve other aspects of the state's management approach. Two industry scoping meetings (held in September 2022 and January 2023) provided valuable input for the development of this extensive proposal.

A list of the proposed changes is below; rationale for each follows later within this memo.

1) Define the following gear groupings for the harvest of menhaden:
    a. Small-scale directed gear: cast nets, traps (excluding floating fish traps), pots, haul seines, hook and line, bag nets, hoop nets, hand lines, and bait nets.
    b. Non-directed gear: pound nets, anchored/stake gillnets, trammel nets, drift gill net, trawls, fishing weirs, fyke nets, and floating fish traps.
2) Adopt a June 15 menhaden fishery season start date and restrict landings prior to this date to small-scale directed and non-directed gears only (i.e., no purse seines) at a 6,000-pound limit harvested from state waters, with an exception for limited access weir fishers to land at a 120,000-pound limit.
3) Revise the limited access fishery's quota use triggers and trip limits, as follows:
    a. 120,000-pound trip limit until 50% quota use.
    b. 25,000-pound trip limit after 50% quota use and until 85% quota use.
    c. 6,000-pound trip limit after 85% quota use and until 100% quota use.
4) Establish open fishing days for the use of purse seines in the menhaden fishery (both limited entry and open access):
    a. Four open days/week, Monday–Thursday, until 50% quota use.
    b. Five open days/week, Monday–Friday, until 100% quota use.
5) Restrict landings after the quota is taken to small-scale directed and non-directed gears only (i.e., no purse seines) at a 6,000-pound limit harvested from state waters.

6) Restrict landings during the EESA fishery to a 6,000-lb trip limit (both limited access and open access) harvested from state waters; the limited access trip limit may be modified by the Director to a maximum of 120,000 pounds.

7) Restrict the use of carrier vessels to only limited entry permit holders operating from June 15 until 85% quota use (i.e., at the 120,000-lb and 25,000-lb trip limits only).

8) Require that all vessels used to carry or hold fish in the limited access fishery (i.e., either the catcher vessel or the carrier vessel if used) have their fish hold capacity certified and marked to demonstrate 25,000-lb and 120,000-lb storage levels by an accredited marine surveyor, and have any fish storage capacity over 120,000 pounds rendered unusable.

9) Require that all purse seine nets used in the menhaden fishery subject to net size restrictions be annually inspected and tagged by DMF prior to fishing for compliance with these restrictions. After its certification, any net that is altered with regards to the net size restrictions must be re-inspected prior to its use.

10) Establish in the regulations the following restrictions on the use of purse seines which currently reside in permit conditions:
    a. State-wide closed days of Saturdays, Sundays, Memorial Day, July 4, and Labor Day
    b. State-wide, year-round night fishing closure
    c. Year-round closure of Buzzards Bay
    d. Friday closed day in Beverly Harbor
    e. Year-round closures in certain Boston Harbor areas (i.e., Charles River, Mystic River, Chelsea River, Dorchester Bay, Neponset River, Marina Bay, Weir River, and Winthrop Harbor, all upstream of established landmarks, and "A Anchorage Areas" with an exception for off Merrymount in Quincy)
    f. The Director may issue permit conditions further affecting the use of purse seines.

11) Establish in regulations the following restrictions on the use of purse seines for menhaden which currently reside in permit conditions:
    a. Maximum purse seine size of 600' in length within the Inshore Restricted Waters.
    b. This action eliminates the hand haul and 400' x 60' maximum net size requirements for the areas of Hingham Bay, Winthrop Bay, and Quincy Bay within Boston Harbor, thus enabling mechanical hauling of a 600' length net consistent with other open Inshore Restricted Waters.

12) Establish in the regulations the following restrictions on the use of carrier vessels which currently reside in permit conditions:
    a. Only limited access permit holders may use a carrier vessel, limited to a single carrier vessel to be named in permit conditions.
    b. The carrier vessel is restricted to receiving menhaden once a day, only on open purse seining days, restricted to receiving and possession the applicable limited entry trip limit, and may land only once per day.
    c. Year-round prohibition on the use of carrier vessels in Boston Harbor.

13) Adopt a June 14, 2023 control date for Menhaden permit endorsements and for CAP-Purse Seine permit endorsements.

14) Require the submission of daily electronic harvester reports prior to landing from all limited access permit holders beginning in 2024.

Introduction

The Atlantic States Marine Fisheries Commission (ASMFC) approved Addendum I to Amendment 3 of the Interstate Fishery Management Plan for Atlantic Menhaden in November 2022 for implementation in 2023. Addendum I revises the state quota shares to reflect more recent landings, removes purse seines from the post-quota incidental catch and small-scale fishery (IC/SSF) allowance, and requires the Menhaden Management Board to take further action to reduce IC/SSF landings if they cause the coastwide total allowable catch (TAC) to be exceeded. The amount of the Episodic Event Set-aside (EESA) was considered for change but remains at 1% of the TAC, with all the same eligibility and use criteria in place. The implications of these new interstate measures are the basis of many of the changes proposed herein.

Massachusetts' state quota share increases from 1.27% to 2.12% under Addendum I, which combined with a 20% increase to the TAC for 2023 (to 233,550 MT), results in a 10.8 million pound quota for Massachusetts. This quota is double that initially allocated to MA the past two years, but is only slightly above the resulting landings, which were allowed to grow primarily through DMF securing quota transfers from other states, but also through our entering the EESA fishery and minor IC/SSF landings (Table 1). Addendum I's quota reallocation means that Massachusetts can start the fishing year with a better sense of what its allowed landings will be. Quota transfers are expected to be less available because many of the states who transferred us quota previously now have a reduced allocation, and there may be less willingness to transfer quota to New England on the heels of what is perceived by many as a major reallocation, as well as interest to direct transfers to more local states whose bait fishery servers their in-state bait needs.

The removal of purse seines from the IC/SSF allowance means that there will be a hard stop on purse seine fishing for menhaden when our state quota is taken, with the exception that EESA *may* be available (5.15 mlb for 2023). Recall, however, that this is a shared pool of quota for Maine–New York (accessible when a state quota is exhausted prior to September); consequently, the availability of EESA quota for any state is not a certainty and history shows that the EESA can be exhausted in a matter of days when multiple states are participating. Racing through our 10.8-mlb quota in hopes of accessing the EESA provides a much greater risk of shutting down the purse seine fishery in mid-summer than if we adopt a quota management approach designed to provide a long season of purse seine access, with the potential to continue small-scale purse seine fishing under the EESA if our state quota is exhausted sooner than expected.

This leads to my goals for the menhaden fishery with regards to our quota use. While one objective is to take our allowed quota, my aim is to do so in a manner that continues to recognize historical users and fleet diversity, that balances the supply of bait to fresh and frozen markets, and allows for an extended season of small-scale harvest that supplies local bait demand. Without any changes to our quota strategy (i.e., 120,000-lb trip limit from June 1–85% quota use, and 25,000-lb trip limit until 100% quota use), DMF projects that our newly elevated quota would be taken by early July 2023 assuming prior year catch rates hold (Figure 1). This will not achieve many of the above-stated objectives.

Elsewhere throughout this proposal I am including changes to improve the management of other aspects of the fishery, with goals for a high level of compliance and accountability, and minimizing user group conflict. The rationale for each change is provided below. This proposal does not include an industry request to liberalize the maximum net size of surface gillnets to 600' (up from 300') so as to maintain the small-scale nature of this open access gear.

Rationale for each component of DMF's Menhaden Fishery Proposal

Proposal	Rationale
1) Define the following gear groupings: a. Small-scale directed gear: cast nets, traps (excluding floating fish traps), pots, haul seines, hook and line, bag nets, hoop nets, hand lines, and bait nets. b. Non-directed gear: pound nets, anchored/stake gillnets, trammel nets, drift gill net, trawls, fishing weirs, fyke nets, and floating fish traps.	Definitions are consistent with the interstate FMP and will be used to comply with Addendum I's requirement for IC/SSF eligible gears.
2) Adopt a June 15 menhaden fishery season start date and restrict landings prior to this date to small-scale directed and non-directed gears only (i.e., no purse seines) at a 6,000-pound limit harvested from state waters, with the exception for limited access weir fishers to land at a 120,000-pound limit.	Delaying the season start date from June 1 to June 15 was widely supported at the scoping meetings as a means to extend the season in a neutral way across the diverse fleet. Both ME and NH are expected to have similar start dates for 2023. Prohibiting all purse seine landings before the season start date will preserve the quota for later in the season when harvest is better aligned with bait needs; with the trap gear closure to protect right whales extending into mid-May, the lobster trap fishery is not beginning in earnest until mid-June. The remaining authorized gears contribute insignificantly to state landings, with the exception of weirs which can have occasional non-directed catch in the spring, hence their larger limit to prevent unnecessary discarding is maintained. Landings prior to June 15 would be allowed from state waters only.
3) Revise the limited access fishery's quota use triggers and trip limits, as follows: a. 120,000-pound trip limit until 50% quota use b. 25,000-pound trip limit after 50% quota use and until 85% quota use c. 6,000-pound trip limit after 85% quota use and until 100% quota use	Part (a) is expected to provide a comparable level of access to the large-scale historical users who provide fish at the necessary quality for the frozen bait market (i.e., from refrigerated holds), over a projected 2 ½ weeks. Part (b) is expected to provide another 3-4 weeks' worth of harvest at the mid-scale level, recognizing this group of historical users who supply the fresh market. Part (c) responds to the removal of purse seines from the IC/SSF and effectively brings that part of the fishery under quota management, possibly for another 5-6 weeks' worth of fishing. Overall, and combined with the June 15 season start date (#2 above) and closed purse seining days (#4 below), projections suggest the quota managed fishery staying open into September under this approach, assuming similar catch rates as 2022 (Figure 2).

4) Establish open fishing days for the use of purse seines in the menhaden fishery (both limited and open access): a. Four open days/week, Monday–Thursday, until 50% quota use b. Five open days/week, Monday–Friday, until 100% quota use	This closes Friday to purse seining when the trip limit is at 120,000-pounds for limited entry and 6,000-pounds for all others. This period is expected to have the highest daily catch rates (e.g., 500,000 lb/day). Closing Fridays will reduce the weekly harvest rate, and ameliorate rec/com conflict on a popular sportfishing day. Fridays are not proposed for closure when the trip limit is reduced to 25,000 pounds due to lower daily catch rates at that time (e.g., 200,000 lb/day) and business practices of smaller vessels that sell locally into the fresh market, with Fridays reported to be an important day.
5) Restrict landings after the quota is taken to small-scale directed and non-directed gears only (i.e., no purse seines) at a 6,000-pound limit harvested from state waters.	The removal of purse seines from the IC/SSF is a new compliance measures under the interstate plan (Addendum I to Amendment 3). Landings after the quota is taken would be allowed from state waters only.
6) Restrict landings during the EESA fishery to a 6,000-lb trip limit (both limited access and open access); the limited access trip limit may be modified by the Director to a maximum of 120,000 pounds.	The FMP authorizes a maximum 120,000-pound trip limit for the EESA; however, DMF has previously set EESA trip limits consistent with those in place at the end of the quota managed fishery (e.g., 25,000 pounds) such that the fishery continues at a similar scale rather than ramping up again. A 6,000-lb EESA limit would be consistent with this prior practice given the 6,000-pound limit now proposed for the remaining 15% of quota use. Set in this manner, the EESA has the potential to allow the continuation of purse seine fishing after the quota is taken, similar to how they could previously continue at 6,000 lb under the IC/SSF. However, the Director could increase the EESA limit up to the maximum set in the FMP in response to fishery conditions, when the EESA is accessed, etc.
7) Restrict the use of carrier vessels to only limited entry permit holders operating from June 15 until 85% quota use (i.e., at the 120,000-lb and 25,000-lb trip limits only).	Allowing all vessels to use a carrier essentially increases their capacity and is in conflict with the history of our trip limits which were based on the capacity of the harvester vessels in the fishery at that time. The use of carriers has been restricted to limited entry permit holders through permit conditions previously, but here we propose to restrict their use to the higher trip limits as well. While we initially considered allowing carriers only at the highest trip limit (120,000 lb), this proposal better reflects current practice (as told during scoping). This would prevent limited access harvesters from using a carrier only at the smallest trip limit (6,000 lb), when the goal is season length. (Open access harvesters are prevented from using carriers at the 6,000-lb limit under another section, see #12 below.)

8) Require that all vessels used to carry or hold fish in the limited access fishery (i.e., either the catcher vessel or the carrier vessel if used) have their fish hold capacity certified and marked to demonstrate 25,000-lb and 120,000-lb storage levels by an accredited marine surveyor, and have any fish storage capacity over 120,000 pounds rendered unusable.	Massachusetts Environmental Police (MEP) have requested this provision to aid in the enforcement of the larger trip limits. It is akin to the requirement for fish retained under a 6,000-lb trip limit to be immediately stored in totes or barrels. This rule was modeled after Rhode Island's requirement. It is a one-time requirement for a vessel.
9) Require that all purse seine nets used in the menhaden fishery subject to net size restrictions be annually inspected and tagged by DMF prior to fishing for compliance with these restrictions. After its certification, any net that is altered with regards to the net size restrictions must be re-inspected prior to its use.	MEP have requested this provision to aid in enforcement of the net size restrictions, which are difficult to evaluate compliance in the field. Prior to the season start, DMF would establish a schedule of days prior to the purse seine season's commencement during which fishery participants could have their nets inspected. Net size restrictions apply to purse seines used during any 6,000-pound trip limit fishery (450' L x 48' D) and those used in any Inshore Restricted Waters (600' L).
10) Establish in the regulations the following restrictions on the use of purse seines which currently reside in permit conditions: a. State-wide closed days of Saturdays, Sundays, Memorial Day, July 4, and Labor Day b. State-wide, year-round night fishing closure c. Year-round closure of Buzzards Bay d. Friday closed day in Beverly Harbor e. Year-round closures in certain Boston Harbor areas (i.e., Charles River, Mystic River, Chelsea River, Dorchester Bay, Neponset River, Marina Bay, Weir River, and Winthrop Harbor, all upstream of established landmarks, and "A Anchorage Areas" with an exception for off Merrymount in Quincy) f. The Director may issue permit conditions further affecting the use of purse seines.	These are pre-existing permit conditions on the use of purse seines in Massachusetts. Moving them to regulations is expected to aid in compliance and enforcement, provide more transparency and clarity on applicable rules, and incorporate public comment and MFAC approval processes into any changes. Other restrictions on purse seines not listed here will remain as permit conditions to grant the Director some additional flexibility and discretion in management. These include: - Avoidance of fixed gear - Avoidance of areas of concentrated recreational fishing activity - Use of spotter planes (time and area restrictions) - Contacting the Salem Harbormaster prior to conducting seining activity in Salem Harbor.

11) Establish in regulations the following restrictions on the use of purse seines for menhaden which currently reside in permit conditions: a. Maximum purse seine size of 600' in length within the Inshore Restricted Waters. b. This action eliminates the hand haul and 400' x 60' maximum net size requirements for the areas of Hingham Bay, Winthrop Bay, and Quincy Bay within Boston Harbor, thus enabling mechanical hauling of a 600' length net consistent with other open Inshore Restricted Waters.	The purse seine net size restriction in Inshore Restricted Waters is a pre-existing permit conditions on the use of purse seines for menhaden (Figure 3). Moving this to regulation is expected to aid in compliance and enforcement, provide more transparency and clarity on applicable rules, and incorporate public comment and MFAC approval processes into any changes. Previously, the areas of Hingham Bay, Winthrop Bay, and Quincy Bay within Boston Harbor were subject to additional restrictions of a smaller net size (400' x 60') and hand haul requirement (Figure 4). An industry request was received to drop these additional restrictions because they: 1) are outdated restrictions that reflect prior conflict with large-scale seining activity, which is now precluded by the carrier vessel prohibition in Boston Harbor; and 2) can displace fishing effort into times and places where there is more potential for user group conflict.
12) Establish in the regulations the following restrictions on the use of carrier vessels which currently reside in permit conditions: a. Only limited access permit holders may use a carrier vessel, limited to a single carrier vessel to be named in permit conditions. b. The carrier vessel is restricted to receiving menhaden once a day, only on open purse seining days, restricted to receiving and possession the applicable limited entry trip limit, and may land only once per day. c. Year-round prohibition on the use of carrier vessels in Boston Harbor.	These are pre-existing permit conditions on the use of carrier vessels in the menhaden fishery. Moving them to regulations is expected to aid in compliance and enforcement, provide more transparency and clarity on applicable rules, and incorporate public comment and MFAC approval processes into any changes.
13) Adopt a June 14, 2023 control date for Menhaden permit endorsements and for CAP-Purse Seine permit endorsements.	This control date may be used to determine eligibility criteria for participation in either the limited entry or open access menhaden fisheries in the future, subject to rulemaking. Interest in the menhaden fishery has been increasing and fishery participants requested a control date at the scoping meetings.

14) Require the submission of daily electronic harvester reports prior to landing from all limited access permit holders beginning in 2024.	Daily reporting aids in quota monitoring (especially with the daily catch rates achieved by this fishery) and is required for participation in the EESA fishery per the interstate FMP. Current general reporting requirements in MA are monthly trip-level reporting for harvesters and weekly trip-level reporting for dealers. For the menhaden fishery, we have required limited access participants and anyone participating in the EESA to obtain a bait dealer permit and report daily. Daily harvester reports would aid in compliance and enforcement of trip limits, especially when the same entity is acting as both harvester and dealer. Implementation would be delayed until 2024 to provide harvesters with sufficient time and instruction on the adoption of the requirement.

Attachments
January 13, 2023 Menhaden Scoping Meeting Presentation

Table 1. Summary of MA quota and landings, 2018-2022. MA quota in 2023 = 10.8 mlb.

	2018	2019	2020	2021	2022
Quota	6.06 mlb	6.05 mlb	6.05 mlb	5.42 mlb	5.42 mlb
Transfers	-	1.30 mlb	2.35 mlb	2.36 mlb	2.96 mlb
Adjusted Quota	6.06 mlb	7.35 mlb	8.40 mlb	7.78 mlb	8.37 mlb
Quota Use	94%	95%	100%	100%	100%
EESA	-	-	0.36 mlb	1.96 mlb	1.74 mlb
IC/SSF	-	-	0.05 mlb	0.17 mlb	0.59 mlb
Total Landings	5.71 mlb	6.96 mlb	8.83 mlb	9.92 mlb	10.42 mlb

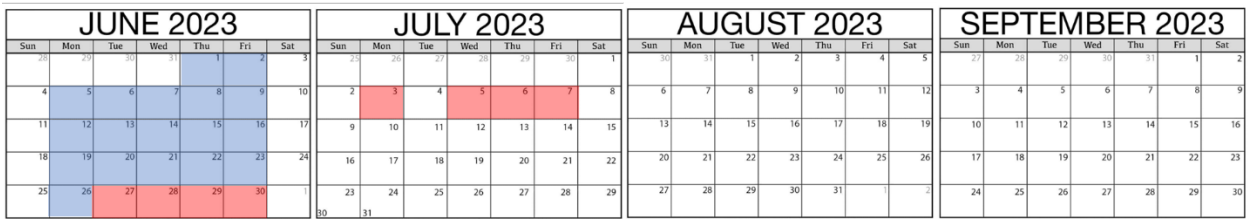

Figure 1. Projection for Quota Managed Fishery season length under <u>existing</u> quota use triggers, trip limits, and purse seining closed days, assuming similar daily catch rates as 2022.
Blue days = 125,000-lb trip limit until 85% quota use (9.2 mlb of quota access)
Red days = 25,000-lb trip limit until 100% quota use (1.6 mlb of quota access)

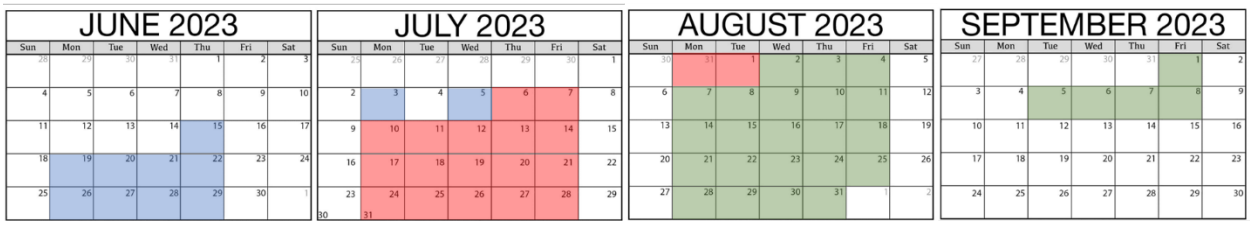

Figure 2. Projection for Quota Managed Fishery season length under <u>proposed</u> quota use triggers, trip limits, and purse seining closed days, assuming similar daily catch rates as 2022.
Blue days = 120,000-lb trip limit until 50% quota use (5.4 mlb of quota access)
Red days = 25,000-lb trip limit until 85% quota use (3.8 mlb of quota access)
Green days = 6,000-lb trip limit until 100% quota use (1.6 mlb of quota access)

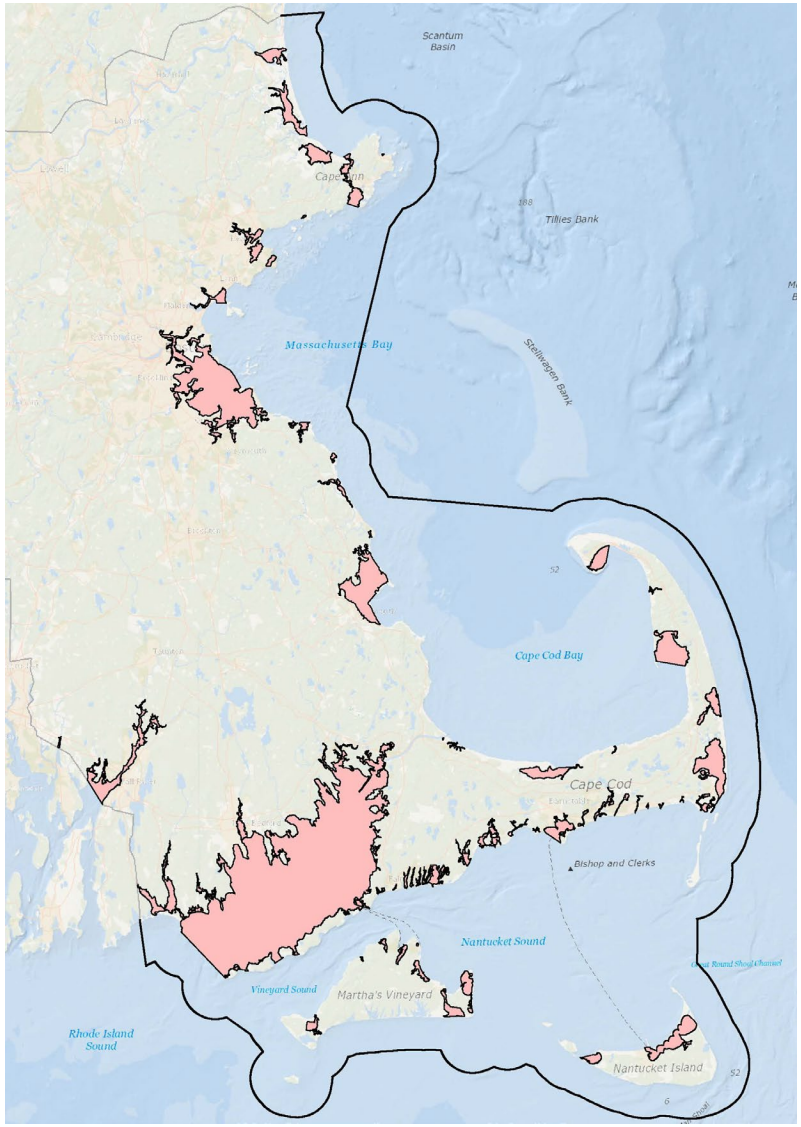

Figure 3. Inshore Restricted Waters, for which an inshore net permit endorsement is required to use any net other than a cast net or small bait net (≤250 sq ft). Purse seines are restricted to a 600' length maximum in the Inshore Restricted Waters. Other restrictions apply in certain areas.

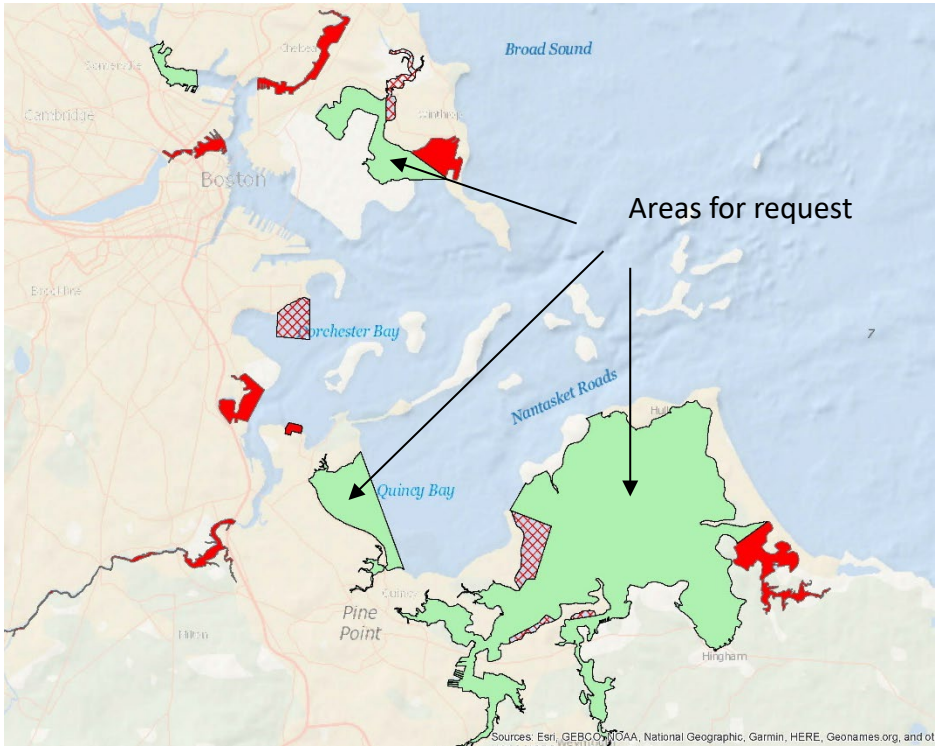

Figure 4. Areas of Boston Harbor proposed to have an existing hand haul requirement and 400' x 60' net size restriction lifted.

Anchorage A Areas closed to seining
Prohibited Areas closed to seining
Restricted Areas

2023 Menhaden State Fishery Management

Scoping Meeting #2
January 12, 2023

Massachusetts Division of Marine Fisheries

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MA Menhaden Fishery Management

- Limited Access Fishery (menhaden permit endorsement)
  - 6,000-lb limit through May 31 (except weirs); 125,000-lb limit June 1 – 85% quota; 25,000-lb limit until 100% quota
  - Owner-operator requirement and daily reporting
  - Carrier vessels authorized by LOA: 1 limit/day; prohibited in Boston Harbor
- Open Access Fishery (general commercial fishing permit)
  - 6,000-lb limit from January 1 – 100% quota
  - Max. purse seine size (450'L * 48'D), storage requirements
- Inshore Net Permit: limited access to purse seine in inshore waters (map)
  - Extensive permit conditions
- Incidental Catch & Small-scale Fishery (all harvesters after quota taken)
  - 6,000-lb trip limit
  - Max. purse seine size (450'L * 48'D), storage requirements
- Episodic Event Set-aside Fishery (1% of TAC for ME-NY, conditional access)
  - Opt-in process after quota taken before Sept 1; trip limits by permit type; state water harvest and landing only; daily reporting

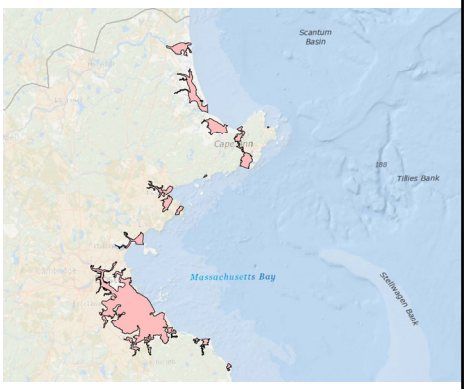

Figure shows Inshore Net Areas of North Shore in pink. Inshore net permit required for all nets other than cast nets and small bait nets (≤250 sq ft).
Cast nets and small bait nets require no specific permit to take bait for personal use.

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Interstate Management Plan Changes for 2023

1. **Quota Reallocation**
2. Purse Seines Eliminated from Incidental Catch/ Small-scale Fishery

Effective	2013-2017	2018-2022	2023-2025
FMP	Amendment 2	Amendment 3	Addendum I
Landings Basis	2009-2011	2009-2011, with a 0.5% default minimum	2018/19/21, with 3-tier minimum (0.01/0.25/0.5%)
EESA	1%	1%	1%
MA Share	**0.84%**	**1.27%**	**2.12%**
MA Quota (*initial*)	**3.1 – 3.7 mlb**	**5.4 – 6.0 mlb**	**10.8 mlb**
(*transfers*)	Gave away up to 510,000 lb	Received up to 3.0 mlb	tbd

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Interstate Management Plan Changes for 2023

1. Quota Reallocation
2. **Purse Seines Eliminated from Incidental Catch/ Small-scale Fishery**

IS/SSF Eligible Gears	
"small-scale directed"	"non-directed"
cast nets, traps (excluding floating fish traps), pots, haul seines, hook and line, bag nets, hoop nets, hand lines, and bait nets	pound nets, anchored/stake gillnets, trammel nets, drift gill net, trawls, fishing weirs, fyke nets, and floating fish traps

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MA Landings

	2018	2019	2020	2021	2022	2023
Quota	6.06 mill (1.27%)	6.05 mill (1.27%)	6.05 mill (1.27%)	5.42 mill (1.27%)	5.42 mill (1.27%)	10.82 (2.12%)
Transfers	-	1.30 mill	2.35 mill	2.36 mill	2.96 mill	*Likely less available or needed*
Adjusted Quota	6.06 mill	7.35 mill	8.40 mill	7.78 mill	8.37 mill	
Quota Use	94%	95%	100%	100%	100%	
EESA	-	-	0.36 mill	1.96 mill	1.74 mill	*5.15 mlb available (ME-NY)*
IC/SSF	-	-	0.05 mill	0.17 mill	0.59	*Likely negligible w/o purse seines*
Total Landings	5.71 mill	6.96 mill	8.83 mill	9.92 mill	10.42 mill	
% Coastwide	1.37%	1.51%	2.17%	2.30%	TBD	

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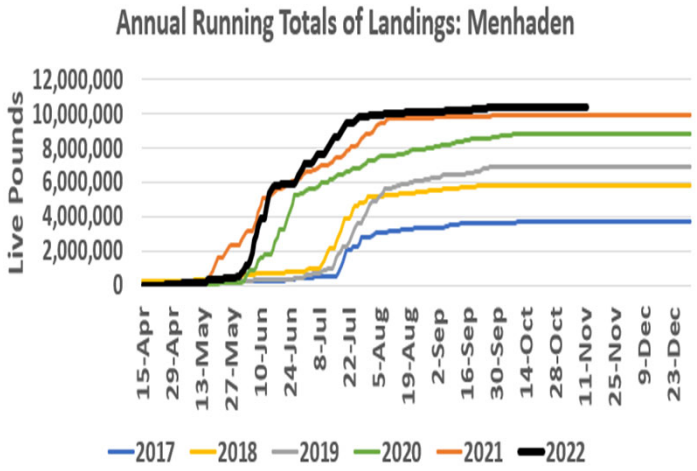

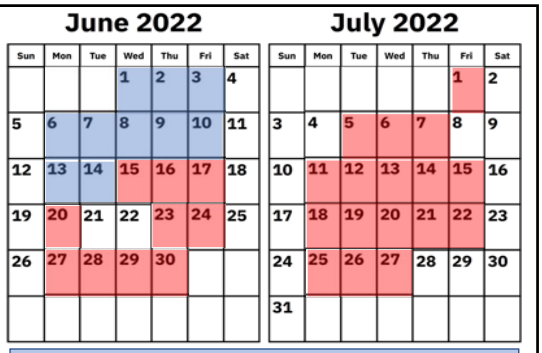

125,000-lb trip limit
10 days with avg daily landings of ~500,000 lb
About half of total landings from June 1-14.

25,000-lb trip limit
27 days with avg daily landings of ~200,000 lb
(4 days quota, 10 days EESA, 13 days quota transfers)

6,000-lb IC/SSF trip limit
Sporadic landings thru Sept.; ~10,000 lb/day avg

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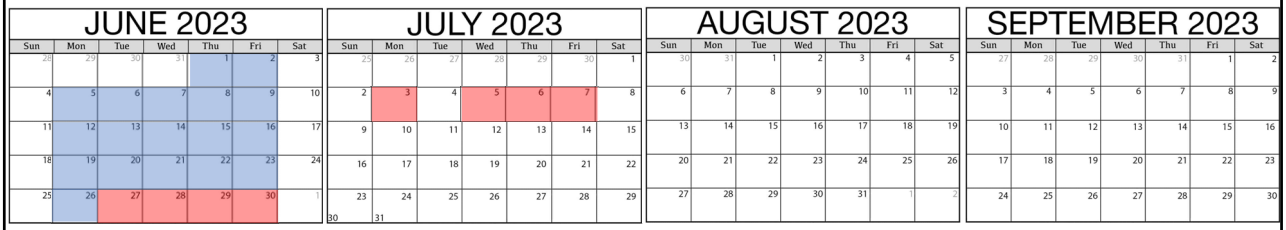
Hypothetical Scenarios for 2023 (A)

If no modifications other than FMP requirement to prohibit purse seines from IC/SSF:

- 125,000-lb trip limit until 85% quota = 9.2 mlb of quota would last 18 days at last year rate (500K/day).
- 25,000-lb trip limit until 100% quota = 1.6 mlb of quota would last 8 days at last year rate (200K/day).
- *Potential* for EESA access after quota closure.
- 6,000-lb IC/SSF limit for non-purse seine gears. Purse seine fishery done early July.



Quota Management Goals: utilize quota, recognize historical users at various capacity levels, balance quota use for frozen and fresh bait, allow for long season of small-scale harvest.
Multiple goals not achieved without additional management changes.

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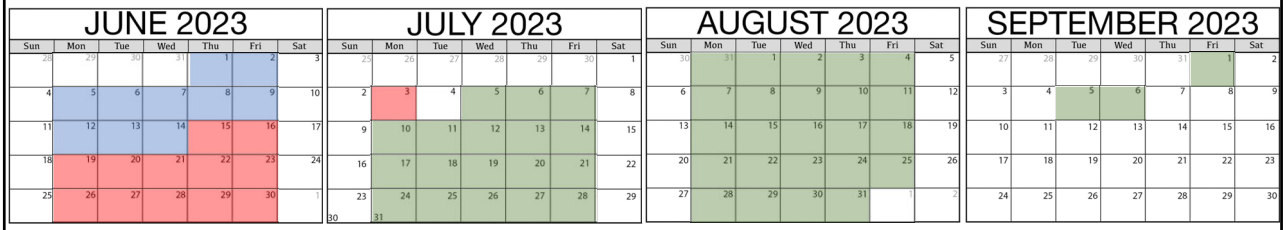
Hypothetical Scenarios for 2023 (B)

Modify quota use triggers and add 6,000-lb limit into quota fishery:

- 125,000-lb trip limit until 50% quota = 5.4 mlb of quota would last 10 days at last year rate (500K/day).
- 25,000-lb trip limit until 75% quota = 2.7 mlb of quota would last 13 days at last year rate (200K/day).
- 6,000-lb trip limit until 100% of quota = 2.7 mlb of quota would last 45 days at 60K/day (conservative guestimate).
- Potential for EESA access after quota closure (if before September 1 and EESA remains).
- Non-purse seine gears at 6,000-lb IC/SSF limit after quota closure.



- Alternate example: 25,000-lb trip limit until *85% quota* = 3.8 mlb of quota would last 18 days (thru 7/12), with 27 days for 6,000-lb trip limit at remaining 15% of quota (thru 8/18), then access EESA if available.

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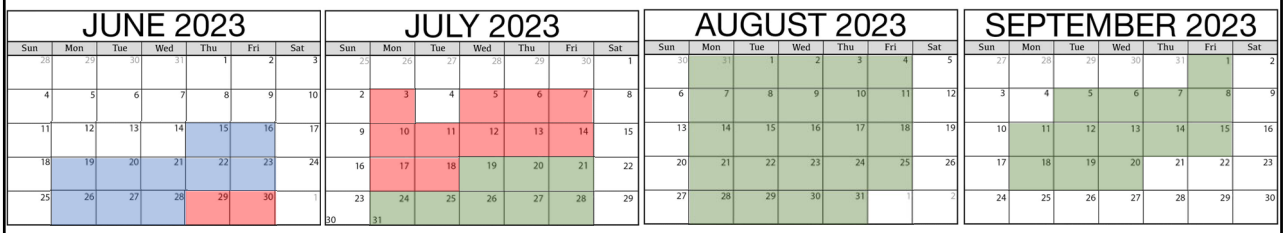
Hypothetical Scenarios for 2023 (C)

In addition to those trip limit & trigger modifications, possible options:

- Delay **season start date** from June 1 to June 15 (6,000-lb limit all gears except weirs until June 15)
  - ➢ Impact: push everything back 2 weeks



- **Restrict gear** access to pre-season landings
  - FMP definition of small-scale directed and non-directed (same as post-season IC/SSF); i.e., no purse seine
  - ➢ Impact: pre-season landings have been mostly weirs, so impact is mostly preventative.

125,000-lb trip limit until 50% quota
25,000-lb trip limit until 75% quota
6,000-lb trip limit until 100% quota

Massachusetts Division of Marine Fisheries

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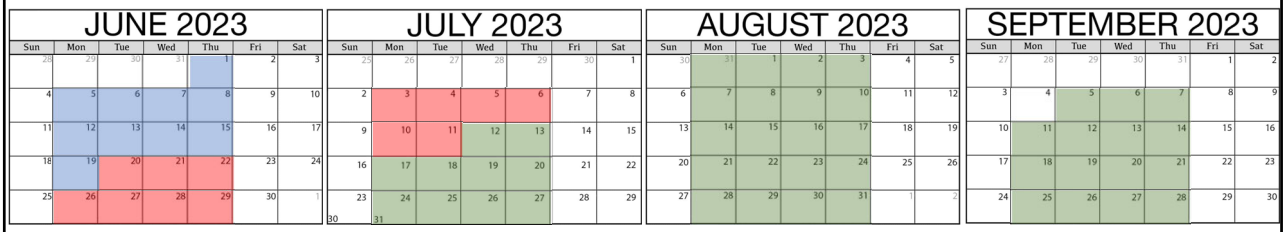
Hypothetical Scenarios for 2023 (D)

In addition to those trip limit & trigger modifications, possible options:

- Establish uniform **open fishing days** for all areas (e.g., Mon-Wed or *Mon-Thurs shown below*),
  - Shown below for all gears restricted Fri-Sun; days off could be gear specific
  - ➢ Impact: lengthen season and reduce user conflict



- Adjust **trip limit** (e.g., 80,000 lb to 40,000 lb to 10,000 lb)
  - ➢ Impact: slow catch rate and/or align with fishery practices (vessel capacity, truck capacity)
- Prohibit **carrier vessels** when trip limit decreases
  - ➢ Impact: slow catch rate and mitigate compliance issues with lower trip limits

125,000-lb trip limit until 50% quota
25,000-lb trip limit until 75% quota
6,000-lb trip limit until 100% quota

Massachusetts Division of Marine Fisheries

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Enforcement & Compliance

Under Consideration:

- Prohibit carrier vessels when trip limit decreases (e.g., from 125,000 to 25,000 lb)
  - Maintain historical rationale for smaller limits relative to vessel size
  - Use of carrier vessels during 25,000-lb fishery linked to vessel overages in prior years
- Bait hold capacity restriction and/or capacity certification for limited entry vessels
  - Improve enforcement of larger trip limits
  - Akin to measures enacted for 6,000-lb limit (storage into totes or barrels)
- Annual purse seine net certification for compliance with requirements
- eVTR harvester reporting and vessel tracking for menhaden permit holders

- Deferred:
  - Prohibiting at-sea sales
  - Pre-trip notification requirement

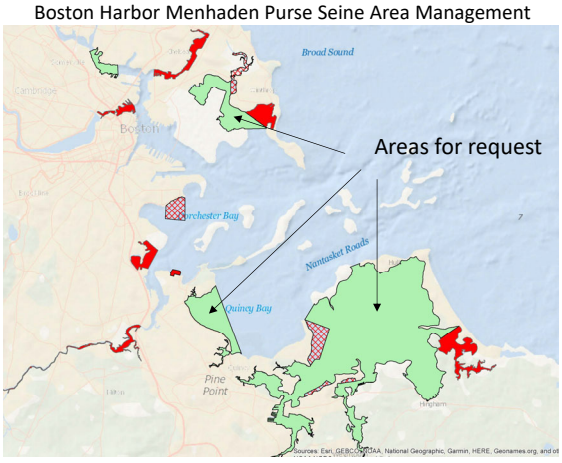
11

Housekeeping

- DMF manages menhaden seine fishery through annual permit conditions.
- Potential interest in codifying certain long-standing conditions as regulation.
  - Season start date (currently June 1)
  - Avoidance of fixed fishing gear and concentrated recreational fishing activity
  - Night closure
  - Closed fishing days (e.g., Sat/Sun & holidays in inshore net areas)
  - Maximum purse seine size (600’ unless further restricted by specific area)
  - Use of carriers (e.g., reporting requirements, possession limits, area closures)
- More enforceable and clear; less able to be changed from year-to-year, with more transparency.

12

Boston Harbor Menhaden Purse Seine Area Management



Anchorage A Areas closed to seining
Prohibited Areas closed to seining
Restricted Areas

Industry Request # 1

- Inshore net permit conditions establish specific rules for use of purse seines inside Boston Harbor.
- Conditions include prohibition on mechanical haul and restriction on maximum purse seine size (400' L x 60' D) within "Restricted Areas".
- DMF has received a request to lift these hand haul and net size requirements in Hingham Bay, Winthrop, and Quincy Bay
  - i.e., to allow mechanical haul of nets up to 600' L
  - Provided rationale: outdated restrictions that reflect prior conflict with large-scale seining activity (carriers now excluded) that make small-boats less efficient and do not serve a conservation benefit.

13

Industry Request #2

- Use of surface gillnets
  - Requires open entry endorsement for use of gear.
  - Requires inshore net permit to access inshore restricted areas.
  - Must be actively tended with vessel within 200 feet of net at all times.
  - Limited to fishing no more than 300 linear feet of nets at one time.
  - Net mesh must be ≥ $1\ ^{7}/_{8}$" and ≤ 3 ¾".
  - May only retain bait species (mackerel, menhaden, sea herring).
  - Some area and season closures.
- DMF has received a request to increase net size allowance to 600 linear feet (e.g., two 300-ft nets tied together or fished separately), applicable to quota-managed and IC/SSF.
  - Provided rationale: to enable viable commercial harvest. One 300' net sufficient for personal bait use only; yields 6 barrels (2100 lb) on best day. NH allows up to two gill nets of no more than 300' L by 20' D each.

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Summary of Issues for Input

- Quota use trigger levels & trip limits
- Season start dates
- Open fishing days
- Carrier vessel use restrictions
- Bait hold capacity restriction and/or certification
- Annual purse seine net certification
- eVTR and vessel tracking for menhaden permit holders
- Codifying purse seine permit conditions
- Industry request re: Boston Harbor restricted area conditions
- Industry request re: surface gillnet length restriction
- Other

Massachusetts Division
of Marine Fisheries

15

Commercial Menhaden Rules

Proposals

1) Define the following gear groupings for the harvest of menhaden:
   a. Small-scale directed gear: cast nets, traps (excluding floating fish traps), pots, haul seines, hook and line, bag nets, hoop nets, hand lines, and bait nets.
   b. Non-directed gear: pound nets, anchored/stake gillnets, trammel nets, drift gill net, trawls, fishing weirs, fyke nets, and floating fish traps.
2) Adopt a June 15 menhaden fishery season start date and restrict landings prior to this date to small-scale directed and non-directed gears only (i.e., no purse seines) at a 6,000-pound limit harvested from state waters, with an exception for limited access weir fishers to land at a 120,000-pound limit.
3) Revise the limited access fishery's quota use triggers and trip limits, as follows:
   a. 120,000-pound trip limit until 50% quota use.
   b. 25,000-pound trip limit after 50% quota use and until 85% quota use.
   c. 6,000-pound trip limit after 85% quota use and until 100% quota use.
4) Establish open fishing days for the use of purse seines in the menhaden fishery (both limited entry and open access):
   a. Four open days/week, Monday–Thursday, until 50% quota use.
   b. Five open days/week, Monday–Friday, until 100% quota use.
5) Restrict landings after the quota is taken to small-scale directed and non-directed gears only (i.e., no purse seines) at a 6,000-pound limit harvested from state waters.
6) Restrict landings during the EESA fishery to a 6,000-lb trip limit (both limited access and open access) harvested from state waters; the limited access trip limit may be modified by the Director to a maximum of 120,000 pounds.

Commercial Menhaden Rules

Proposals (cont)

7) Restrict the use of carrier vessels to only limited entry permit holders operating from June 15 until 85% quota use (i.e., at the 120,000-lb and 25,000-lb trip limits only).

8) Require that all vessels used to carry or hold fish in the limited access fishery (i.e., either the catcher vessel or the carrier vessel if used) have their fish hold capacity certified and marked to demonstrate 25,000-lb and 120,000-lb storage levels by an accredited marine surveyor, and have any fish storage capacity over 120,000 pounds rendered unusable.

9) Require that all purse seine nets used in the menhaden fishery subject to net size restrictions be annually inspected and tagged by DMF prior to fishing for compliance with these restrictions. After its certification, any net that is altered with regards to the net size restrictions must be re-inspected prior to its use.

10) Establish in the regulations the following restrictions on the use of purse seines which currently reside in permit conditions:

    a. State-wide closed days of Saturdays, Sundays, Memorial Day, July 4, and Labor Day

    b. State-wide, year-round night fishing closure

    c. Year-round closure of Buzzards Bay

    d. Friday closed day in Beverly Harbor

    e. Year-round closures in certain Boston Harbor areas (i.e., Charles River, Mystic River, Chelsea River, Dorchester Bay, Neponset River, Marina Bay, Weir River, and Winthrop Harbor, all upstream of established landmarks, and "A Anchorage Areas" with an exception for off Merrymount in Quincy)

    f. The Director may issue permit conditions further affecting the use of purse seines.

Commercial Menhaden Rules (cont)

Proposals (cont.)

11) Establish in regulations the following restrictions on the use of purse seines for menhaden which currently reside in permit conditions:
    a. Maximum purse seine size of 600’ in length within the Inshore Restricted Waters.
    b. This action eliminates the hand haul and 400’ x 60’ maximum net size requirements for the areas of Hingham Bay, Winthrop Bay, and Quincy Bay within Boston Harbor, thus enabling mechanical hauling of a 600’ length net consistent with other open Inshore Restricted Waters.
12) Establish in the regulations the following restrictions on the use of carrier vessels which currently reside in permit conditions:
    a. Only limited access permit holders may use a carrier vessel, limited to a single carrier vessel to be named in permit conditions.
    b. The carrier vessel is restricted to receiving menhaden once a day, only on open purse seining days, restricted to receiving and possession the applicable limited entry trip limit, and may land only once per day.
    c. Year-round prohibition on the use of carrier vessels in Boston Harbor.
13) Adopt a June 14, 2023 control date for Menhaden permit endorsements and for CAP-Purse Seine permit endorsements.
14) Require the submission of daily electronic harvester reports prior to landing from all limited access permit holders beginning in 2024.

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CHARLES D. BAKER, Governor | KARYN E. POLITO, Lt. Governor | BETHANY A. CARD, Secretary | RONALD S. AMIDON, Commissioner | DANIEL J. MCKIERNAN, Director

MEMORANDUM

TO: Marine Fisheries Advisory Commission (MFAC)

FROM: Daniel J. McKiernan, Director

DATE: February 8, 2023

SUBJECT: **Proposal to Accommodate Groundfish Maximum Retention Program**

Proposal
I am proposing to adopt language in DMF's multi-species groundfish regulations that would accommodate the federal maximum retention and electronic monitoring (MREM) program. This will be accomplished by exempting participating federally permitted multi-species groundfish sector vessels and federally permitted dealers from the state's minimum size standards for regulated multispecies groundfish species, subject to federally established requirements.

Background
At the start of the 2018 federal fishing year (May 1, 2018 – April 30, 2019), the Gulf of Maine Research Institute (GMRI) partnered with NOAA Fisheries, the Northeast Fisheries Science Center (NEFSC), and the New England states to develop an MREM program for the federal sector managed multi-species groundfish fishery. In summary, vessels who chose to voluntarily participate in the MREM research program would be allowed full retention of multi-species groundfish catch (i.e., no regulatory discarding) subject to electronic monitoring (EM) supplemented by dockside monitoring. Its purpose was to create incentives for sector vessels to adopt EM; develop standards to effectively implement MREM on a broader scale; identify challenges; and inform future policy making decisions regarding EM programs in the region.

This program was initially implemented by NOAA Fisheries via a Scientific Research and Exempted Fishing Permit (EFP) accompanied by state authorizations to participating fishers and dealers in the New England states where the fish were being landed and sold. It has been ongoing for the past several years, has involved a few Massachusetts commercial fishing permit holders and seafood dealers, and was generally viewed favorably by the research partners and seafood industry participants. In 2022, the New England Fishery Management Council proceeded to formally adopt this program as part of Amendment 23 to the Northeast Multispecies Fishery Management Plan (FMP). Then Amendment 23 and the MREM program became part of the federal code of regulations on January 9, 2023.

In anticipation of the adoption of the MREM program as part of Amendment 23, DMF took on accommodating the federal program in state regulations during DMF's fall 2022 rule making process. We received no comments on the proposal during the public comment period or public hearing. However, we ultimately chose not to move forward a final recommendation as part of this rule making initiative because we did not have the benefit of reviewing final federal regulations. Given protocol affecting state

rule making, we now have to proceed to public hearing again to take comment on this proposal. During the interim period between the implementation of Amendment 23 and DMF adopting complementary state rules, Massachusetts has and will continue to accommodate the MREM program through Letters of Authorization. Currently, one vessel is participating in the program.

Accommodating Federal MREM Program

Proposal:
Create an exemption to state groundfish regulations to authorize possession & landing of non-conforming groundfish species by federal permit holders participating as commercial fisher or dealer in MREM program.

Background

- MREM started in 2018 as pilot project with GMRI, GARFO, & states.
- Purpose was to incentivize electronic monitoring to study challenges & inform future policy.
- Was accommodated via federal EFP & state LOA from 2018 to present.
- Generally viewed as successful program.
- Adopted by NOAA Fisheries as part of Amendment 23 to Multi-Species FMP.
- Proposed regulation will replace LOA & allow lawfully caught fish to be landed & sold in MA.

Atlantic States Marine Fisheries Commission

2023 Winter Meeting Summary

Sustainable and Cooperative Management of Atlantic Coastal Fisheries

2023 Winter Meeting
January 31 – February 2, 2023

For more information, please contact Toni Kerns, ISFMP, Tina Berger, Communications or the identified individual at 703.842.0740

Meeting Summaries, Press Releases and Motions

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ATLANTIC HERRING MANAGEMENT BOARD (JANUARY 31, 2023)

Meeting Summary

The Atlantic Herring Management Board met to consider setting specifications for the 2023-2025 fishing years for Atlantic herring.

In September 2022, the New England Fishery Management Council (NEFMC) voted on a 2023-2025 specifications package which was later submitted to NOAA Fisheries for review and approval. NEFMC's recommended specifications are based on the 2022 Atlantic herring stock assessment and recommendations from the NEFMC Scientific and Statistical Committee, which are consistent with the Atlantic herring biomass-based control rule and with the Atlantic herring rebuilding plan. NOAA Fisheries is planning to publish an interim final rule in February 2023 to implement the 2023-2025 specifications package. The Board adopted the 2023-2025 specifications package as recommended by NEFMC, contingent on the final rule being published by NOAA Fisheries.

For more information, please contact Emilie Franke, Fishery Management Plan Coordinator, at EFranke@asmfc.org.

Motions

Move to adopt the following specifications for the 2023-2025 fishing years for Atlantic herring as recommended by the New England Fishery Management Council, contingent on the final rule being published by NOAA Fisheries:

For 2023

- **Annual Catch Limit (ACL) = 12,429 mt**
- **Domestic Annual Harvest = 12,429 mt**
- **Area 1A Sub-ACL = 3,592 mt**
- **Area 1B Sub-ACL = 534 mt**
- **Area 2 Sub-ACL = 3,455 mt**
- **Area 3 Sub-ACL = 4,847 mt**

For 2024

- **Annual Catch Limit (ACL) = 19,189 mt**
- **Domestic Annual Harvest = 19,189 mt**
- **Area 1A Sub-ACL = 5,546 mt**
- **Area 1B Sub-ACL = 825 mt**
- **Area 2 Sub-ACL = 5,335 mt**
- **Area 3 Sub-ACL = 7,484 mt**

For 2025

- **Annual Catch Limit (ACL) = 23,961 mt**
- **Domestic Annual Harvest = 23,961 mt**
- **Area 1A Sub-ACL = 6,925 mt for 2025**
- **Area 1B Sub-ACL = 1,030 mt for 2025**
- **Area 2 Sub-ACL = 6,661 mt for 2025**
- **Area 3 Sub-ACL = 9,345 mt for 2025**

For all three years:

- **Border Transfer = 0 mt each year**
- **Fixed Gear Set-Aside= 30 mt each year**
- **Research Set-Aside as % of Sub-ACLs= 0% each year**

Motion made by Ms. Griffin and seconded by Mr. Reid. Motion passes by unanimous consent.

AMERICAN LOBSTER MANAGEMENT BOARD (JANUARY 31, 2023)

Press Release

American Lobster Draft Addendum XXVII Approved for Public Comment
Addendum Considers Measures to Increase Protection of Spawning Stock Biomass of the Gulf of Maine/Georges Bank Stock

Arlington, VA – The Commission's American Lobster Management Board approved Draft Addendum XXVII to Amendment 3 to the Interstate Fishery Management Plan for American Lobster for public comment. The Draft Addendum considers implementing management measures – specifically gauge and escape vent sizes – to provide additional protection to the spawning stock biomass (SSB) in the Gulf of Maine/Georges Bank (GOM/GBK) stock. The Draft Addendum also considers immediate action upon final approval to standardize some management measures within and across the Lobster Conservation Management Areas (LCMAs) that include the GOM/GBK stock.

The Board initiated the Addendum as a proactive measure to improve the resiliency of the GOM/GBK stock. Since the early 2000s, landings in the GOM/GBK stock have exponentially increased. In Maine alone, landings have increased from 57 million pounds in 2000 to a record high of 132.6 million pounds in 2016. Maine landings have declined slightly but were still high at 97.9 million and 108.9 million in 2020 and 2021, respectively. However, since 2012, lobster settlement surveys throughout the GOM have generally been below the time series averages in all areas. These surveys, which measure trends in the abundance of juvenile lobsters, can be used to track populations and potentially forecast future landings. Persistent lower densities of settlement could foreshadow decline in recruitment and landings. In the most recent years of the time series, declines in other recruitment indices have also been observed.

Given the economic importance of the lobster fishery to many coastal communities in New England, especially in Maine, potential reductions in landings could have vast socioeconomic impacts. In addition, the 2015 Stock Assessment combined the GOM and GBK stocks into a single biological unit due to evidence of migration between the two regions. As a result, there are now varying management measures within a single biological stock. In response to these two issues, Draft Addendum XXVII considers the standardization of management measures across LCMAs. The purpose of considering more consistency in measures is to resolve discrepancies between the regulations for state and federal permit-holders, to provide a consistent conservation strategy, and simplify enforcement across management areas and interstate commerce.

Draft Addendum XXVII considers two approaches for implementing changes to gauge and escape vent sizes to enhance protection of the GOM/GBK spawning stock. One approach would establish a trigger mechanism whereby pre-determined management changes would be implemented upon reaching a

defined trigger level based on observed changes in recruitment abundance indices. The second approach would establish a schedule for implementing changes to the gauge and escape vent sizes. The proposed measures include an increase to the minimum gauge size and escape vent sizes in LCMA 1 (Gulf of Maine) and decreases to the maximum gauge size in LCMA 3 (offshore federal waters) and Outer Cape Cod. The proposed gauge and escape vent sizes are expected to increase the proportion of

the population that is able to reproduce before being harvested by the fishery, and to enhance stock resiliency by protecting larger lobsters of both sexes.

The Draft Addendum will be posted to the website next week at http://www.asmfc.org/about-us/public-input. A subsequent press release will provide the details on the public hearing schedule and how to submit written comments. The Board will meet to review submitted comment and consider final action on the addendum in May 2023 at the Commission's Spring Meeting in Arlington, VA. For more information, please contact Caitlin Starks, Senior Fishery Management Plan Coordinator, at cstarks@asmfc.org or 703.842.0740.

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PR23-02

Meeting Summary

In addition to approving Draft Addendum XXVII on increasing protection of spawning stock biomass of the Gulf of Maine/Georges Bank (GOM/GBK) stock for public comment, the American Lobster Management Board (Board) also considered a report from NOAA Fisheries on the Atlantic Large Whale Take Reduction Team (ALWTRT) and progress on Atlantic Large Whale Take Reduction Plan, and an update on the implementation of American Lobster Addendum XXIX and Jonah Crab Addendum IV.

NOAA Fisheries staff presented the results of the ALWTRT meeting in late 2022. The ALWTRT's goal was to recommend measures in the pot/trap and gillnet fisheries along the Atlantic coast to reduce mortality and serious injury of right whales in US commercial fisheries to below the Potential Biological Removal level required by the Marine Mammal Protection Act. NOAA staff reviewed the types of measures considered and stakeholder input provided by the ALWTRT, noting that a consensus recommendation was not produced. NOAA staff also updated the Board on recent North Atlantic right whale entanglement incidents.

Staff provided an update on the implementation of American Lobster Addendum XXIX and Jonah Crab Addendum IV, which establish electronic tracking requirements for federally-permitted vessels in both fisheries. The Work Group that was formed to solicit and review quotes from vessel tracking device manufacturers received five applications for type approval. Four devices met all of the criteria specified in the Addenda, and have been approved for use in the fishery. Over the next several months, ASMFC staff will work with the states to provide information on the approved tracking devices to harvesters and establish administrative programs to implement the addendum requirements.

For more information, please contact Caitlin Starks, Senior Fishery Management Plan Coordinator, at cstarks@asmfc.org or 703.842.0740.

Motions

Move to modify Option E by including a 1/4" maximum gauge reduction in LCMA 3 with each annual adjustment, and set a maximum gauge size in the OCC management area of 6 ½" and include a 1/4" maximum gauge reduction in OCC with each annual adjustment. In the final year of adjustments, the maximum gauge size in LCMA 3 and OCC would be 6" at a minimum. The vent size in LCMA 1, LCMA 3 and OCC would be adjusted once, at the same time the final gauge size is implemented. The Board, during final action will specify the years of the schedule, with the first step occurring no later than 2026, and the second step occurring 2 years later.

Motion made by Mr. Keliher and seconded by Mr. Hasbrouck. Motion approved by consensus.

Move to approve Addendum XXVII for public comment, as amended today.
Motion made by Mr. Grout and seconded by Mr. Train. Motion carries without objection.

WINTER FLOUNDER MANAGEMENT BOARD (JANUARY 31, 2023)

Press Release

Management Track Assessments Find Winter Flounder Stocks for the Gulf of Maine and Southern New England/Mid-Atlantic Not Experiencing Overfishing

Arlington, VA – The Commission's Winter Flounder Management Board reviewed the results of the Northeast Fisheries Science Center's (NEFSC) management track stock assessments* for the Gulf of Maine (GOM) and Southern New England/Mid-Atlantic (SNE/MA) winter flounder stocks. These assessments found GOM winter flounder is not experiencing overfishing while the SNE/MA winter flounder stock is not overfished nor experiencing overfishing. The overfished status for the GOM stock remains unknown. The management track assessments for both stocks include data through 2021.

SNE/MA winter flounder experienced a change in stock status from overfished to not overfished due to a change in the years of recruitment estimates used to estimate biological reference points. Instead of drawing upon the entire time series of recruitment estimates, the projections now only use recruitment estimates from the past 20 years (2002-2021). The SNE/MA winter flounder stock is most likely not capable of achieving the high levels of recruitment that were observed prior to 2000 due to changes in environmental conditions; therefore, using a truncated recruitment time series of only the past 20 years better reflects current stock condition. However, despite a change in stock status; trends in survey indices and model estimates all continue to indicate the SNE/MA stock is in poor condition.

The GOM stock uses a modeling method that incorporates survey indices of abundance to obtain area-swept biomass and exploitation estimates. There have been time series lows in fishery removals (harvest and discards) for GOM winter flounder in recent years. Overall, the indices of abundance have not responded positively to the large declines in commercial and recreational removals since the 1980s. However, there were increases in the fall 2021 and spring 2021 and 2022 area-swept biomass estimates, which, if they continue, could be the beginning of a response to continued low fishery removals. It should be noted, however, that no survey data is available for 2020 due to the COVID pandemic, which is a source of uncertainty in this area-swept assessment that relies on survey data.

Given this information, specifications recommended by New England Fishery Management Council, and recommendations from the Technical Committee and Advisory Panel, the Board maintained 2023 recreational and commercial measures for the GOM and SNE/MA winter flounder stocks for the 2024-2025 fishing years (see Table 1).

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* Management track assessments are similar to the Commission's stock assessment updates, where the model from the most recent benchmark assessment is updated to include recent data. However, with the NEFSC's process, some changes are allowed to be made to the model, such as a change to the recruitment time series used to estimate biological reference points that occurred for SNE/MA winter flounder.

Table 1. 2024-2025 Winter Flounder Commercial and Recreational Measures for Gulf of Maine and Southern New England/Mid-Atlantic Stocks.

Stock	Sector	Trip Limit/ Possession Limit	Size Limit	Season	Gear
GOM	Commercial	500 lbs/ trip/day	12"	Maintain closures	Minimum 6.5" square or diamond mesh in cod-end.
	Recreational	8 fish	12"	Open all year	
SNE/MA	Commercial	50 lbs/38 fish/trip/day	12"	Maintain closures	Minimum 6.5" square or diamond mesh in cod-end. 100-lb mesh trigger.
	Recreational	2 fish	12"	Maintain closures	

The next management track assessments for both stocks are scheduled for 2024, and the next research track assessment, the equivalent of the Commission's benchmark stock assessments, are scheduled for both stocks in 2026. As part of this analysis, the NEFSC will attempt to incorporate climate data into the SNE/MA winter flounder stock assessment. The management track assessment reports for GOM and SNE/MA winter flounder are available on the Commission's website at http://www.asmfc.org/species/winter-flounder under Stock Assessment Reports. An overview of the assessment is available at http://www.asmfc.org/uploads/file/63d6c34bWinterFlounderStockAssessmentOverview_Feb2022.pdf. It was developed to aid media and interested stakeholders in better understanding the assessment results.

For more information, please contact Tracey Bauer, Fishery Management Plan Coordinator, at tbauer@asmfc.org.

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PR23-01

Meeting Summary

The Winter Flounder Management Board approved state compliance and Fishery Management Plan (FMP) Reviews for the 2021 fishing year for winter flounder. All states' regulations were found to be consistent with the FMP, and the Board approved all *de minimis* status for New Jersey's commercial fishery. The Board also considered and approved the nomination of Allan Butler of Massachusetts to the Winter Flounder Advisory Panel.

For more information, please contact Tracey Bauer, Fishery Management Plan Coordinator, at TBauer@asmfc.org.

Motions

Move to approve status quo commercial and recreational Southern New England/Mid-Atlantic and Gulf of Maine winter flounder measures for the 2024-2025 fishing years.
Motion made by Mr. McManus and seconded by Dr. Davis. Motion approved by unanimous consent.

Move to approve the Winter Flounder FMP Review for the 2021 fishing year, state compliance reports, and *de minimis* status for New Jersey commercial fisheries.
Motion made by Mr. Hasbrouck and seconded by Mr. Reid. Motion approved by unanimous consent.

Move to approve Allan Butler of MA to the Winter Flounder Advisory Panel.
Motion made by Mr. McKiernan and seconded by Dr. Davis. Motion approved by unanimous consent.

ATLANTIC STRIPED BASS MANAGEMENT BOARD (JANUARY 31, 2023)

Meeting Summary

The Atlantic Striped Bass Management Board met to consider selecting management measures and final approval of Addendum I to Amendment 7 to the Interstate Fishery Management Plan (FMP) for Atlantic Striped Bass.

The Board initiated Draft Addendum I in August 2021 after deciding that changes to the striped bass commercial quota system would not be considered during the ongoing development of Amendment 7. The Draft Addendum considers voluntary quota transfers which could provide some relief to states seeking additional quota. In November 2022, the Board approved Draft Addendum I for public comment with proposed options to consider permitting voluntary transfers of commercial quota, including options based on stock status and options allowing the Board to set criteria for transfers on a regular basis.

The Board received a summary of the 1,979 written public comments and 186 public hearing comments submitted for Draft Addendum I, as well as a report and recommendations from the Atlantic Striped Bass Advisory Panel. After initial discussion on the proposed management options, the Board voted to postpone action on Addendum I until May 2023 when analysis from the Striped Bass Technical Committee (TC) will be available. The Board tasked the TC with conducting stock projections to determine how specific quota utilization scenarios would impact the stock and rebuilding timeline. The first scenario assumes the entire ocean commercial quota is harvested and the second scenario assumes the entire ocean quota is harvested except for New Jersey's quota, since New Jersey's quota is reallocated to the recreational fishery and therefore unavailable for commercial quota transfers. These scenarios would be compared to the baseline scenario which assumes commercial quota utilization does not change. The TC projections will incorporate preliminary 2022 MRIP data in response to the Board's interest in reviewing 2022 removals data as soon as possible (other 2022 removal data will be considered if available).

The Board's rationale for this TC task is to address concerns raised by a majority of public comments that commercial quota transfers would negatively impact stock rebuilding. Board

members asked questions regarding how much commercial quota transfers would increase the fishing mortality rate, and what the resulting impact on the probability of 2029 rebuilding would be. The TC projections for May 2023 discussion are intended to address these questions.

2022 removals will be incorporated into the Fishery Management Plan Review of the 2022 Fishing Year. For more information, please contact Emilie Franke, Fishery Management Plan Coordinator, at EFranke@asmfc.org.

Motions

Main Motion

Move to approve Option D (Board discretion commercial quota transfer provision (with overfished conservation tax)).

Motion made by Mr. Clark and seconded by Mr. Train. Motion substituted.

Motion to Substitute

Move to substitute to postpone action on Addendum I and task the Technical Committee (TC) with running two population projections:

- **One which assumes harvest of the entire ocean commercial quota from all states**
- **One which assumes harvest of the ocean commercial quota from all states except New Jersey (since their quota is reallocated out of the commercial fishery)**

The TC may use their expert judgement on other needed assumptions for the projections (i.e. selectivity) to produce the most realistic output for consideration by the board.

Motion made by Dr. McNamee and seconded by Dr. Davis. Motion passes (13 in favor, 3 opposed).

Main Motion as Substituted

Move to postpone action on Addendum I and task the TC with running two population projections:

- **One which assumes harvest of the entire ocean commercial quota from all states**
- **One which assumes harvest of the ocean commercial quota from all states except New Jersey (since their quota is reallocated out of the commercial fishery)**

The TC may use their expert judgement on other needed assumptions for the projections (i.e. selectivity) to produce the most realistic output for consideration by the board.

Motion passes (15 in favor, 1 opposed).

EXECUTIVE COMMITTEE (FEBRUARY 1, 2023)

Meeting Summary

The Executive Committee (Committee) met to discuss several issues, including Consolidated Appropriations Act (CCA) Update; potential stipend for Legislative and Governor Appointee (LGA) Commissioners; collection of sharks for scientific and educational purposes; distribution of Fishery Disaster Funding in FY23 Omnibus Spending Bill; and Northeast biological sampling. The following action items resulted from the Committee's discussions:

- Staff provided an update on the balance in the CAA cooperative agreement. There is projected to be roughly $8.6 million remaining that will be reallocated to states who indicated additional need

after the November Executive Committee meeting. Eight states indicated a need and a proposed reallocation was approved at the Executive Committee meeting.

- A discussion was held regarding providing a stipend to the LGA Commissioners for their service to ASMFC. The discussion focused on providing stipends for participation in meetings beyond the four quarterly meeting weeks and joint meetings with the Mid-Atlantic Fishery Management Council, noting this work is beyond the traditional scope of Commissioner responsibilities. The Committee asked staff to research potential tax advantages for Commissioners for volunteering their time to the Commission. This issue will be discussed at the next Committee meeting.

- The coordination of the collection of sharks for scientific and educational purpose was discussed. Currently, the states have different procedures for approving and issuing permits for collecting sharks. The states agreed that improved coordination would help ensure that the collection of sharks is not having a negative impact on the populations of sharks. If additional coordination between the states and NOAA Fisheries is necessary, the issue will be referred to the Coastal Shark Management Board.

- The Committee discussed the distribution of $300 Million in Fishery Disaster Funding provided in the FY23 Omnibus Spending Bill. Staff was directed to send a letter to NOAA Fisheries requesting that the available funding be partially applied to fishery disasters on the Atlantic coast. The letter will also request that NOAA work with Congress to streamline the process for fishery disaster declaration, funding, and spend plan approval.

- Biological sampling in the Northeast has been significantly reduced in the past few years. The reduction erodes the assessment and management of multiple species in the northeast. The states agreed to explore opportunities to assist NOAA Fisheries in collecting fish length and otolith samples. A meeting between the states and NOAA Fisheries will be scheduled to determine where there are opportunities for collaboration.

- Chair Woodward noted that the Commission received a letter from The Southeastern Massachusetts Pine Barrens Alliance expressing concerns about the management of horseshoe crabs.

For more information, please contact Laura Leach, Director of Finance & Administration, at lleach@asmfc.org or 703.842.0740.

Motions
No motions were made.

AMERICAN EEL MANAGEMENT BOARD (FEBRUARY 1, 2023)

Meeting Summary
The American Eel Management Board met to consider the 2022 Benchmark Stock Assessment and Peer Review Reports and the Fishery Management Plan Review (FMP) and state compliance reports for the 2021 fishing year.

The American eel stock is at or near historically low levels due to a combination of historical overfishing, habitat loss, food web alterations, predation, turbine mortality, environmental changes, toxins and contaminants, and disease. The stock assessment presentation outlined the continued challenges for assessing the species, models and analyses used in the assessment, an index-based method for setting catch limits, and stock status. For this assessment, a delay-difference model was explored and associated reference points were developed, but the Stock Assessment Subcommittee (SAS) did not recommend it for management use. Instead, the SAS used an index-based method called I_{TARGET} to determine stock status and to develop catch advice.

The Peer Review Panel found that the stock assessment sufficiently addressed all terms of reference, but recommended additional work to test the robustness of the I_{TARGET} method for setting catch limits using a simulation approach within a management strategy evaluation (MSE) framework before it is used for management. The SAS indicated that additional simulation work is possible to address several of the peer review comments and would be more informative than an MSE. Additionally, the SAS and Peer Review Panel provided differing advice on stock status. Consistent with the Commission's Technical Support Group Guidance and Benchmark Stock Assessment Process, the Board tasked the SAS with providing justification for deviating from the advice from the Peer Review Panel the peer review advice. The SAS will provide a report and additional analyses to the Board at a future meeting.

The Board also approved the American Eel FMP Review and state compliance reports for the 2021 fishing year. Commercial yellow eel landings increased in 2021 compared to 2020, but are still low relative to prior years. The Board also approved *de minimis* requests from New Hampshire, Massachusetts, Pennsylvania, District of Columbia, Georgia, and Florida for their yellow eel fisheries. Florida did not meet the *de minimis* criteria because their landings for the last two years slightly exceeded 1% of the coastwide landings. However, the Board agreed to grant Florida continued *de minimis* status because the state's contribution to the coastwide landings of yellow eel has increased as a result of the decrease in total landings.

For more information on the stock assessment, please contact Dr. Kristen Anstead, Stock Assessment Scientist, at kanstead@asmfc.org; and for more information on management, please contact Caitlin Starks, Senior FMP Coordinator, at cstarks@asmfc.org.

Motions

Main Motion

Move to approve the American Eel FMP Review and state compliance reports for the 2021 Fishing year, and *de minimis* requests from New Hampshire, Massachusetts, Pennsylvania, District of Columbia, and Georgia for their yellow eel fisheries.

Motion made by Mr. Clark and seconded by Mr. Grout. Motion amended.

Motion to Amend

Move to amend to add Florida to the *de minimis* request.

Motion made by Ms. Burgess and seconded by Mr. Maniscalco. Motion passes (14 in favor, 3 opposed, 1 abstention, 1 null).

Main Motion as Amended
Move to approve the American Eel FMP Review and state compliance reports for the 2021 Fishing year, and de minimis requests from New Hampshire, Massachusetts, Pennsylvania, District of Columbia, Florida, and Georgia for their yellow eel fisheries.
Motion passes (18 in favor, 1 opposed).

Move to elect Kris Kuhn as Vice Chair of the American Eel Management Board.
Motion made by Ms. Madsen and seconded by Mr. Clark. Motion passes by consent.

ATLANTIC MENHADEN MANAGEMENT BOARD (FEBRUARY 1, 2023)

Meeting Summary
The Atlantic Menhaden Management Board met to review the Plan Review Team (PRT) report on state implementation plans for Addendum I and to consider Technical Addendum I to Addendum I for approval.

The PRT determined that each state satisfied the requirements of Addendum I to Amendment 3 by the May 1, 2023 deadline established by the Board and gave a few recommendations for states to consider. The Board approved the state implementation plans, as presented.

The Board also approved Technical Addendum I to Addendum I, which corrects a paragraph in Addendum I to redistribute relinquished quota based on landings from 2018, 2019, 2021. This change is consistent with the timeframe approved by the Board in Addendum I to allocate commercial quota. The Technical Addendum will become effective for the 2023 fishing year, and the 1,000,000 pounds relinquished by the state of Delaware will be redistributed according to the new timeframe.

For more information, please contact James Boyle, Fishery Management Plan Coordinator at jboyle@asmfc.org.

Motions
Move to approve the state implementation plans for Addendum I to Amendment 3.
Motion made by Ms. Fegley and seconded by Mr. Gary. Motion carries without opposition.

Move to approve Technical Addendum I to Addendum I and have the measures become effective for the 2023 fishing year.
Motion made by Mr. Kuhn and seconded by Ms. Meserve. Motion carries without objection.

SPINY DOGFISH MANAGEMENT BOARD (FEBRUARY 1, 2023)

Press Release

ASMFC Spiny Dogfish Board Sets Quota for 2023/2024 Fishing Season

Arlington, VA – The Commission's Spiny Dogfish Management Board approved a coastwide commercial quota for the 2023/2024 fishing season (May 1-April 30) of 12 million pounds (state-specific allocations are provided in table below). The quota is consistent with the measures recommended to NOAA

Fisheries by the Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC). The Board also maintained the commercial trip limit in state waters of 7,500 pounds for the northern region states of Maine through Connecticut. The states of New York through North Carolina have the ability to set state-specific trip limits based on the needs of their fisheries. The Commission's actions are final and apply to state waters (0-3 miles from shore). The MAFMC and NEFMC will forward their recommendations for federal waters (3 –200 miles from shore) to NOAA Fisheries Greater Atlantic Regional Fisheries Administrator for final approval.

Spiny Dogfish State Allocations (in pounds) for the 2023-2024 Fishing Season

	Northern Region (ME-CT)	NY	NJ	DE	MD	VA	NC
Possession Limit	7,500	To be specified by the individual southern region states					
Allocation	**58%**	**2.71%**	**7.64%**	**0.90%**	**5.92%**	**10.80%**	**14.04%**
2022-2023	*17,144,556*	*800,413*	*2,259,728*	*264,866*	*1,749,935*	*3,191,020*	*4,149,062*
2023-2024	**6,960,000**	**324,935**	**917,359**	**107,525**	**710,403**	**1,295,426**	**1,684,352**

* Any overages in the above quota allocations will be deducted from that region's or state's quota allocation in the subsequent year. Similarly, any eligible rollovers from one season can be applied to that region's or state's quota allocation the following year.

The 2023/2024 coastwide quota represents a 59.4% reduction from the current fishing season's coastwide quota of 29,559,580 pounds. The decreased quota is based on declining trends in several indicators including survey abundance, catch per unit of effort, pup production, and dogfish growth. A research track stock assessment was completed in late 2022, and management advice will be provided through the Northeast Fisheries Science Center's management track assessment that is scheduled for June.

For more information, please contact Caitlin Starks, Senior FMP Coordinator, at cstarks@asmfc.org or 703.842.0740.

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PR23-03

Motions

Move to adopt a 12-million-pound commercial quota for the 2023/2024 fishing year (May 1-April 30) for spiny dogfish, with a 7,500-pound trip limit for the Northern Region, consistent with the actions of the Mid Atlantic Fishery Management Council and New England Fishery Management Council.
Motion made by Mr. Maniscalco and seconded by Mr. Kane. Motion approved by unanimous consent.

Move to nominate Pat Geer as Vice-Chair of the Spiny Dogfish Board.
Motion made by Mr. Batsavage and seconded by Mr. Cimino. Motion passes with no objection.

SHAD & RIVER HERRING MANAGEMENT BOARD (FEBRUARY 2, 2023)

Meeting Summary

The Shad and River Herring Management Board met to consider an update to the North Carolina American shad Sustainable Fishery Management Plan (SFMP); receive a progress update on the River Herring Benchmark Stock Assessment; consider the Fishery Management Plan (FMP) Review for the 2021 fishing year; consider approval of Advisory Panel (AP)nominations; and elect a Vice-Chair.

The Board considered an update to the North Carolina SFMP for American shad, which is required for all states and jurisdictions that have a commercial fishery for American shad under Amendment 3 to the Shad and River Herring FMP. Plans are updated and reviewed by the Technical Committee every five years. As a plan update, the general framework of the plan remains relatively the same with some changes to a few of the sustainability parameters to better reflect the data currently being collected and how that data analysis is applied. Commercial fisheries season dates have been changed from fixed season dates to potential time frames in which the fishery can occur to improve management flexibility. For the recreational fishery, the statewide bag limit was changed from a 10 fish shad aggregate to a 10 fish shad aggregate with only one of those fish permitted to be an American shad, resulting in a potential reduction in American shad harvest. The Board approved the presented SFMP.

The Board received an update on the river herring benchmark stock assessment, which outlined the ongoing work of the Life History and Index Working Groups of the Stock Assessment Subcommittee, and gave the schedule for the Methods Workshop. The assessment is scheduled to be presented to the Board at the Annual Meeting in October 2023.

The Board also reviewed the FMP Review and state compliance reports for the 2021 fishing year. In 2021, river herring landings were approximately 2.11 million pounds, which was a 12% increase from 2020, including a 99.7% decrease in bycatch landings. However, it was noted that the dramatic decrease in bycatch could be attributable to the elimination of the Massachusetts portside sampling program and potential differences in NOAA's Northeast Fishery Observer Program data. Non-confidential American shad landings totaled 195,642 pounds, a 39% decrease from 2020. Bycatch landings increased by 96% to represent 17% of the total commercial landings. Hickory shad landings amounted to 99,419 pounds, an 8% increase from 2020, although bycatch landings decreased by 89% to represent 2% of commercial landings. The Plan Review Team (PRT) noted that a number of states could not complete the required monitoring under Amendments 2 and 3 due to the COVID-19 pandemic and persistent staffing issues, among some other minor issues with the new compliance format. However, the PRT did not consider any of the inconsistencies with the FMP significant. Therefore, the Board approved the 2021 FMP Review, state compliance reports, all *de minimis* requests, and the PRT recommendation to slightly alter the format of the compliance reports to improve the consistency of bycatch reporting data.

The Board considered and approved the nominations of Stephen Gephard and William Lucey of Connecticut to the Shad and River Herring Advisory Panel. Additionally, the Board elected Phil Edwards of Rhode Island to the role of Vice-Chair of the Management Board. Finally, the Board tasked staff to arrange an update from the U.S. Geological Survey on the alosine genetic stock identification and tissue repository and for the Technical Committee to provide recommendations regarding future sample collections.

For more information contact James Boyle, Fishery Management Plan Coordinator, at jboyle@asmfc.org.

Motions

Move to approve the updated Shad Sustainable Fishery Management Plan from North Carolina as presented today.

Motion made by Dr. Rhodes and seconded by Mr. Dize. Motion approved by unanimous consent.

Move to approve the Fishery Management Plan Review, state compliance reports, and de minimis requests for ME, NH, MA, and FL for American shad and NH, GA, and FL for river herring for the 2021 fishing year.

Motion made by Mr. Maniscalco and seconded by Ms. Burgess. Motion passes by consent.

Move to approve Stephen Gephard and William Lucey of CT to the Shad & River Herring Advisory Panel.

Motion made by Dr. Davis and seconded by Mr. Miller. Motion passes by consent.

Move to nominate Phill Edwards as Vice-Chair of the Shad & River Herring Board.

Motion made by Mr. Keliher and seconded by Mr. Reid. Motion passes by consent.

INTERSTATE FISHERIES MANAGEMENT PROGRAM POLICY BOARD (FEBRYARY 2, 2023)

Meeting Summary

The Interstate Fisheries Management Program (ISFMP) Policy Board met to receive an update from Executive Committee; review the 2022 Commissioner survey results; discuss Atlantic bonito harvest in state waters, and consider terms of reference (TORs) for the red drum, spot and Atlantic croaker benchmark stock assessments.

The Commission Chair, Spud Woodard, presented the Executive Committee Report to the Board (see Executive Committee meeting summary earlier in this document).

Staff presented the results of the 2022 Commissioner survey results. Overall, the results indicated Commissioners felt the Commission was making progress towards many of the survey questions. It was noted some obstacles to the Commission's success in rebuilding stocks are concerns that have been brought up in the past, such as building state and regional buy-in to make hard management decisions, but climate change and shifting stocks were by far the biggest. Some of the issues Commissioners would like to focus more on include big picture issues such as climate change, ecosystem-based management and shifting stocks. Staff will provide the Executive Committee with a list of major concerns identified in the survey.

A Policy Board member raised concerns regarding increased recreational catch of small Atlantic bonito in their state waters and raised the question, should states put a minimum size limit in place as a cautionary measure for the species? Other states have also seen some increased catch. There is currently no federal or Commission FMP for Atlantic bonito. Some states raised concerns that without a Commission or state FMP their state would not be able to put measures in place. It was

noted, similar discussions were held at the South Atlantic Fishery Management Council for false albacore. Staff will provide an options paper for developing different levels of management for both Atlantic bonito and false albacore at the next meeting. The paper will include state process limitations.

Staff presented the Policy Board with TORs for the upcoming Red Drum, Spot and Atlantic Croaker Benchmark Stock Assessments since the Sciaenids Board did not meet this week. The Board approved the TORs noting they would like the Stock Assessment Committee to look at changes in natural mortality rates over time, with a specific focus on predation potential, for spot and Atlantic croaker. For red drum it was suggested the Stock Assessment Committee reach out to NOAA's Ecosystem Dynamics Assessment Branch for potential participation in the Committee's work. Lastly, there was a request that a bag and size limit analysis be conducted regardless of stock status for Atlantic croaker and spot. Staff confirmed that the analysis could be conducted shortly after the assessment is complete.

Under other business, Emerson Hasbrouck invited the Board and members of the public to complete a survey on monkfish. The Fisheries Department of Cornell Cooperative is working with industry and food exports to increase consumption and demand of local seafood throughout the Northeast region, specifically monkfish via a Saltonstall-Kennedy Grant Program. Lastly, NOAA Fisheries commented on recent questions regarding the NOAA representatives voting on allocation issues during species management boards. It was stated NOAA's interest in allocation issues is focused on the creation of more dynamic allocation systems that set up the Commission and Regional Councils to be more responsive to climate-induced impacts on fisheries.

Motions

Move to approve the Terms of Reference for the 2024 Red Drum Benchmark Stock Assessment as presented today.

Motion made by Mr. Bell and seconded by Mr. Geer. Motion carries by unanimous consent.

Move to approve the Terms of Reference for the 2024 Atlantic Croaker and Spot Benchmark Stock Assessments as presented today.

Motion made by Ms. Fegley and seconded by Mr. Bell. Motion carries by unanimous consent.

Interstate Fisheries Management Update

ASMFC 2023 Winter Meeting &
Forecast for Recreational Scup & Black Sea Bass Emergency Measures

Marine Fisheries Advisory Commission

February 13, 2023

Massachusetts Division of Marine Fisheries

ASMFC 2023 Winter Meeting Updates

MA Hearing March 15th @ 6 pm (virtual)

American Lobster: Draft Addendum XXVII approved for Public Comment

Initiated to provide resiliency to GOM/GBK stock in face of declining indices. Considers:

1) Immediate standardization of some measures within/across LMAs 1, 3 and OCC to most conservative
   - Possible OCC implications: 6 ¾" max size, 1/8" v-notch definition, or mandatory v-notching of all eggers
2) Scheduled or recruitment index-triggered changes: increase in minimum gauge size and escape vent sizes in LCMA 1 (achieving a 3 $^{3}/_{8}$" min gauge), and decreases to the maximum gauge size in LCMA 3 and OCC (achieving a 6" max gauge).

Current Measures	Area 1 (GOM)	Area 3 (offshore)	OCC
Min Gauge	3 $^{1}/_{4}$"	3 $^{17}/_{32}$"	3 $^{3}/_{8}$"
Max Gauge	5"	6 $^{3}/_{4}$"	State Waters: None Federal waters: 6 $^{3}/_{4}$"
V-notch requirement	Mandatory for all eggers	Mandatory for all eggers north of 42°30'	None
V-notch definition	Zero Tolerance	$^{1}/_{8}$" with or w/o setal hairs	State Permitted fishers in states waters: $^{1}/_{4}$" w/o setal hairs Federal permit holders: $^{1}/_{8}$" with or w/o setal hairs

ASMFC 2023 Winter Meeting Updates

Winter Flounder: Stock Assessments & 2023-2024 Specifications

- GOM Stock: Overfished status unknown (assumed depleted but with possible very recent improvement showing in indices), overfishing not occurring
- SNE/MA Stock: Not overfished (change in status due to lower reference points from truncated recruitment used, still considered in poor condition), overfishing not occurring
- ABCs for each stock increased & state waters subcomponents set to account for expected catch (by NEFMC).
- ASMFC maintained existing state waters measures.

	FY 2022		FY 2023-2025	
	ABC	SW Sub-component	ABC	SW Sub-component
GOM	497 mt	194 mt	804 mt	153 mt
SNE/MA	465 mt	21 mt	627 mt	17 mt

Stock	Sector	Possession Limit	Size Limit	Season	Gear
GOM	Commercial	500 lb	12”	Maintain closures	Min 6.5” mesh in cod-end
	Recreational	8 fish	12”	Open all year	
SNE/MA	Commercial	50 lb/38 fish	12”	Maintain closures	Min 6.5” mesh in cod-end; 100-lb mesh trigger
	Recreational	2 fish	12”	Mar 1-Dec 31	

ASMFC 2023 Winter Meeting Updates

Striped Bass: Action Delayed on Draft Addendum I (Quota Transfers)

- Addendum could allow for voluntary transfers of unused coastal commercial quota, with various levels of oversight/control based on option selected
- Public comment was largely in favor of status quo due to concern of increasing F (activating latent quota)
- Board requested projections of how full quota utilization would impact stock and rebuilding timeline
- Preliminary 2022 removals to also be incorporated (which show increase in recreational harvest from 2020-21)
- Final action expected in May

American Eel: New Benchmark Stock Assessment

- New assessment approaches attempted but still hampered by data-poor characteristic
- Index-based approach suggested yellow eel cap too high and overfishing occurring, but Peer Review Panel did not support its use at this time.
- More work pending by Stock Assessment Subcommittee; potential for reduced yellow eel cap and triggering of state-by-state quotas

ASMFC 2023 Winter Meeting Updates

Spiny Dogfish: FY23 Commercial Quota and Northern Region Trip Limit Set

- Consistent with NEFMC and MAFMC action, 12-mlb commercial quota
  - 59% reduction in quota but similar to recent years' landings (2020-2021)
- 7,500-lb trip limit for Northern Region of ME-CT

Spiny Dogfish Research Track Assessment

- New model preferred for use (SS3) and many data improvement incorporated
- Suggests overfishing was occurring in 2011-2019 (and prior to) when landings ~20 mlb, but not overfished
- Management track assessment with data through 2022 this year

Bluefish Research Track Assessment

- New model preferred for use (WHAM) and many data improvements incorporated
- Suggests that bluefish not overfished nor experiencing overfishing (in 2021)
- Management track assessment with data through 2022 this year

Forecasting Recreational Scup & Black Sea Bass Measures

Timeline Overview

- December: ASMFC & MAFMC determine need for 10% coastwide reductions through regional processes
- January - February: States develop range of options
- March 2: ASMFC meeting to approve range of options
- Mid-March: MA scoping meeting
- March 21: MFAC meeting to review DMF preferred approach; expected regulations announced
- May 1: Aim to have emergency measures in place
- Summer: Public hearing & final rule-making

Future RHL vs Harvest Estimate	Stock biomass compared to the target stock size (B/B_{MSY})	Change in Harvest
Future 2-year average RHL is **greater than** the upper bound of the harvest estimate confidence interval (harvest is expected to be lower than the RHL)	**Very high** (at least 150% of the target stock size)	**Liberalization** percent based on the difference between the harvest estimate and the 2-year average RHL, not to exceed 40%
	High (between the target and 150% of the target stock size)	**Liberalization** percent based on the difference between the harvest estimate and the 2-year average RHL, not to exceed 20%
	Low (below the target stock size)	**Liberalization**: 10%
Future 2-year average RHL is **within** the confidence interval of the harvest estimate (harvest is expected to be close to the RHL)	**Very high** (at least 150% of the target stock size)	**Liberalization**: 10%
	High (between the target and 150% of the target stock size)	**No change:** 0%
	Low (below the target stock size)	**Reduction:** 10%
Future 2-year average RHL is **less than** the lower bound of the harvest estimate confidence interval (harvest is expected to exceed the RHL)	**Very high** (at least 150% of the target stock size)	 **Reduction:** 10% 
	High (between the target and 150% of the target stock size)	**Reduction** percent based on the difference between the harvest estimate and the 2-year average RHL, not to exceed 20%
	Low (below the target stock size)	**Reduction** percent based on the difference between the harvest estimate and the 2-year average RHL, not to exceed 40%

Considerations for Northern Region Scup Options

1) MA-NY region: similar starting point for regulations, so achieving 10% reduction as a region through unified approach
2) Bag limit reduction would need to be drastic (e.g., a 15-fish bag limit coastwide achieves only a 5% reduction)
3) Seasonal reductions would affect states differently (e.g., May closure more damaging to MA than other states).
4) Limited effort in Jan – April, but being open then has produced unrealistic MRIP estimates from a few intercepts
5) A ½" size increase can achieve a regionwide 10% reduction but concern about shore access at higher size limits
6) Council recommended federal rule changes: 40 fish limit (2023), Jan – Apr closure (2024)

Massachusetts 2022 Measures • In RI-NY, the for-hire bonus season occurs Sep 1-Oct 31 • RI & CT also have designated shore-only access sites with a 9" minimum size			
Private Vessels	Jan 1 – Dec 31	30 fish/person (150 fish/vessel max.)	10" min
Shore Fishing	Jan 1 – Dec 31	30 fish/person	10" min
For-hire Vessels	Jan 1 – Apr 30	30 fish/person	10" min
	May 1 – Jun 30	50 fish/person	10" min
	Jul 1 – Dec 31	30 fish/person	10" min

Preliminary Massachusetts Scup Option

Northern Region is evaluating:

- 10.5” size limit for all modes except shore; 9.5” size limit for shore fishing (including pausing RI and CT shore programs)
- Closing Jan – Apr
- Reducing for-hire bonus season bag to 40 fish

Mode	Season	Bag	Size
Private Vessels	~~Jan 1 – Dec 31~~ **May 1 – Dec 31***	30 fish/person (150 fish/vessel max.)	~~10” min~~ **10.5” min**
Shore Fishing	~~Jan 1 – Dec 31~~ **May 1 – Dec 31***	30 fish/person	~~10” min~~ **9.5” min**
For-hire Vessels	~~Jan 1 – Apr 30~~	~~30 fish/person~~	~~10” min~~
	May 1 – June 30	~~50 fish/person~~ **40 fish/person**	~~10” min~~ **10.5” min**
	Jul 1 – Dec 31*	30 fish/person	~~10” min~~ **10.5” min**

** season end date needs to be fine-tuned to achieve 10% reduction as a region*

Considerations for MA Black Sea Bass Options

1) MA-NY region: not required to have uniform measures and don't; taking individual approaches to achieve -10% each
2) Taking reduction by season (from front or back end) would require starting in early June or ending in early August
3) A uniform 16 ½" size limit OR 3-fish bag limit would achieve required reduction (with no impact to season)
4) Consideration being given to exempting for-hire fishery from reduction
5) Consideration being given to cutting private/shore bag limit in order to extend their season into fall; would provide valuable information about fall fishing catch rates

Massachusetts 2022 Measures			
Private Vessels Shore Fishing For-hire Vessels	May 21 – Sep 4	4 fish/person	16" min

Preliminary MA Black Sea Bass Options

	Mode	Min. Size	Bag Limit	Open Season
Status Quo	All	16”	4 fish	5/21 – 9/4
Option 1	All	16.5"	4 fish	5/20 - 9/4*
Option 2	All	16"	3 fish	5/20 - 9/4*
Option 3	All	16"	4 fish	5/20 - 6/30
			2 fish	7/1 - 9/4*
Option 4	Private/Shore	16"	3 fish	5/20 - 9/4*
	For-hire		4 fish	
Option 5	Private/Shore	16"	2 fish	5/20 - 10/15*
	For-hire		4 fish	5/20 - 9/4
Option 6	Private/Shore	16"	3 fish	5/20 - 6/30
			1 fish	7/1 - 8/31
			3 fish	9/1 - 10/15*
	For-hire		4 fish	5/20 - 9/4

*Red = change from status quo; * indicates that the season dates need to be fine-tuned to achieve 10% reduction*

Questions?

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
Eric Reid, *Chair* | Thomas A. Nies, *Executive Director*

February 1, 2023

Mr. Michael Pentony
Regional Administrator
Greater Atlantic Regional Fisheries Office
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930

Dear Mike:

Consistent with the consultation requirements of 50 CFR 648.89(f)(3), the Council developed recommendations for proactive accountability measures (AMs) for Gulf of Maine (GOM) cod and GOM haddock for fishing year 2023. These AMs require development by the Regional Administrator (RA) in consultation with the Council, because the appropriate suite of measures (e.g., bag limit, minimum fish size, season) depends on the annual catch limits (ACLs) specified for the upcoming fishing year. The RA may adjust measures to ensure the recreational fishery will achieve, but not exceed, its sub-ACLs. Framework Adjustment (FW) 63 set the recreational fishery sub-ACL at 192 mt for GOM cod and FW 65 proposes a sub-ACL at 610 mt for GOM haddock for fishing year 2023. In particular, the proposed GOM haddock recreational sub-ACL represents an 83% decline from the FY2022 catch limit (3,634 mt).

As part of the consultation process adopted in FW63, the Council also recommended recreational measures for Georges Bank (GB) cod for fishing year 2023. The Council proposed recreational measures that are designed to not exceed the recreational target catch of 113 mt (i.e., the Council's proposal in FW65).

The Council made its recommendations to GARFO with the premise that recreational measures would be implemented by May 1, 2023.

The Recreational Advisory Panel (RAP) met on Jan. 18, 2023, to discuss potential measures. The Groundfish Committee discussed the RAP's recommendations on Jan. 19, 2023, and requested additional information be brought to the Council meeting. The Council, at its January 2023 meeting, then reviewed the RAP recommendations and the additional information requested by the Committee in the development of its recommendations. Based on these discussions, the Council passed the following motions on January 25:

That the Council recommend to GARFO the following recreational measures for 2023:
Gulf of Maine cod

- Open season: September 1 - October 31
- Minimum size: 22 inches
- Possession limit: 1 fish per day

Gulf of Maine haddock

- Open season: May 1 – February 28; April 1–30
- Minimum size: 18 inches
- Possession limit: 15 fish per day

The motion *carried* by consensus with two abstentions (Ms. Etrie and Mr. Pentony).

That the Council recommends to GARFO for recreational measures for 2023:
Georges Bank Cod

- Open season: May 1-31, September 1-April 30 (closed season June 1-August 31)
- Minimum fish size: 23 in
- Possession limit: 5 fish per day

The motion *carried* by consensus with one abstention (Mr. Pentony).

The Council reviewed the information provided by the Center and Council staff on the three groundfish stocks. An updated run of the bioeconomic model indicates that changes to the measures for GOM cod (extension of the fall season while closing the spring season) and GOM haddock (increasing the minimum fish size and decreasing the possession limit) proposed by the Council are unlikely to lead to overages of the sub-ACLs in FY2023. The bioeconomic model indicates that under the Council's proposal the sub-ACLs for GOM cod and GOM haddock would not be exceeded in 99 out of 100 simulation runs and 100 out of 100 simulation runs, respectively.

The Council also discussed that changes to the measures for GB cod (adjusting the closed season to June through August and replacing the slot limit with an increase in the minimum size) were expected to stay within the catch target of 113 mt. The reduction in mortality is anticipated to be approximately 50% from a preliminary estimate for FY2022 (218 mt).

The Council expresses its continued appreciation to NMFS staff for addressing information needs in advance of the RAP, Groundfish Committee, and Council meetings.

Thank you for considering these recommendations. Please contact me if you have questions.

Sincerely,

Thomas A. Nies

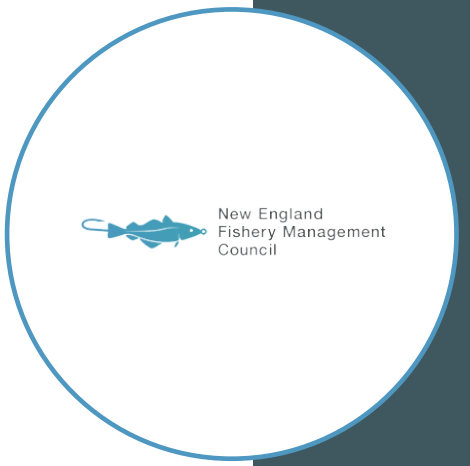
Thomas A. Nies
Executive Director

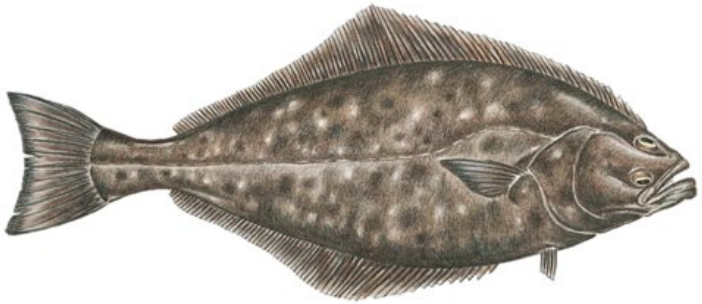
cc: Dr. Jon Hare, NEFSC

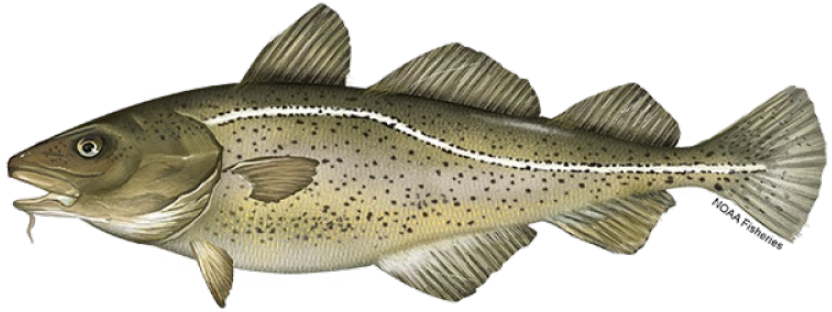
New England Regional Fishery Updates

- **Summary January Council meeting in Portsmouth, NH**

- **Other Council related updates**



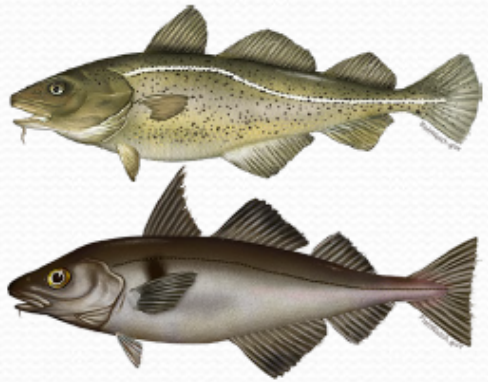




Groundfish

- **Recreational recommendations:**
  - **GOM cod**
  - **GOM haddock**
  - **GB cod**
- **FW65:**
  - **Halibut correction**

Recent Catches



Stock	Fishing Year	Recreational Catch				
		Catch	Landings	Discard	Recreational sub-ACL	Percent of Catch Limit Taken
		A + B	A	B		
GOM Cod	2019	79.8	23.3	56.5	220	36.3
	2020	184.0	41.5	142.4	193	95.3
	2021	146.2	58.6	87.6	193	75.8
	Average	**136.6**	**41.1**	**95.5**	**202**	**67.6**
GOM Haddock	2019	423.2	301.6	121.6	3,194	13.3
	2020	1,202.3	913.7	288.5	6,210	19.4
	2021	901.5	772.8	128.7	5,295	17.0
	Average	**842.3**	**662.7**	**179.6**	**4,900**	**17.2**

Recreational estimates based on Marine Recreational Information Program (MRIP) data.

FY 2020+ GOM cod and GOM haddock receational catch estimates are based on the Fishing Effort Survey (FES). FY 2019 GOM cod and GOM haddock estimates are back calibrated from the FES to the Coastal Household Telephone Survey (CHTS) metrics.

Values in metric tons of live weight

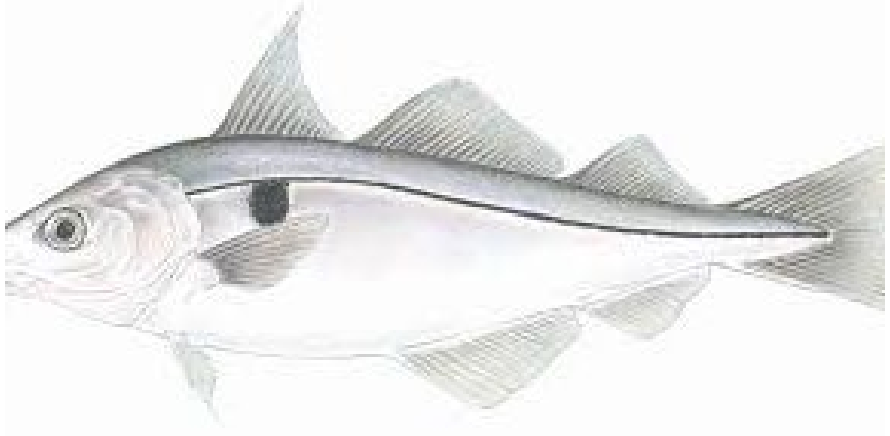
Source: NMFS Greater Atlantic Regional Fisheries Office

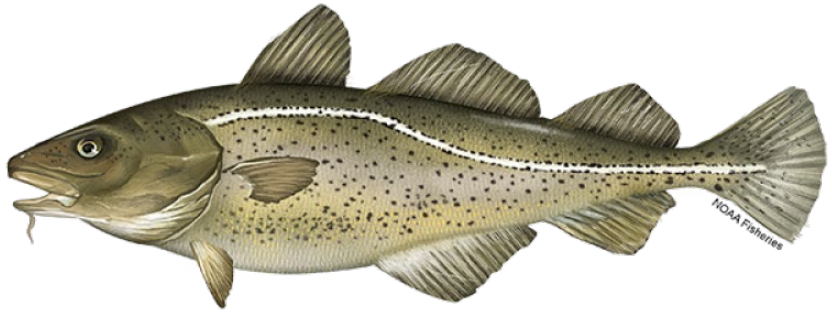
September 12, 2022

These data are the best available to NOAA's National Marine Fisheries Service (NMFS).

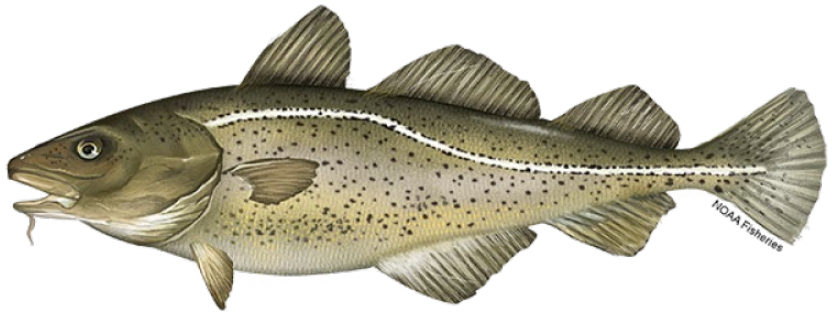
New England
Fishery Management Council

Stock	*FY2022 sub-ACL (mt)*	*Council's Proposal FY2023 sub-ACL (mt)*	*% Change*
GOM Cod	192	192	0%
GOM Haddock	3,634	610	-83%

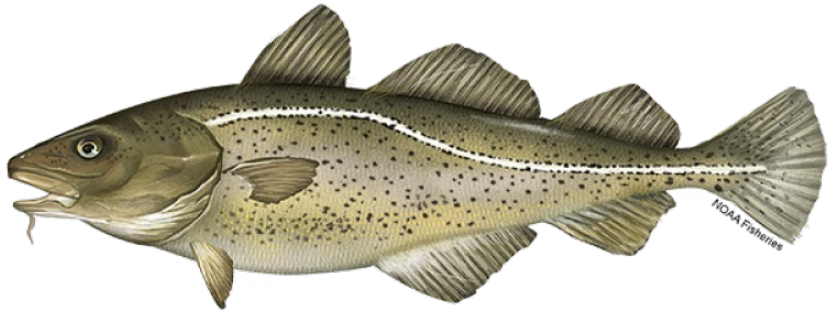




	GOM Cod		GOM Haddock	
	Current	**FY2023**	Current	**FY2023**
Open Season	9/1-10/7; 4/1-4/14	**9/1-10/31**	5/1-2/28; 4/1-4/30	**5/1-2/28; 4/1-4/30**
Minimum Size	22”	**22”**	17”	**18”**
Possession limit	1	**1**	20	**15**

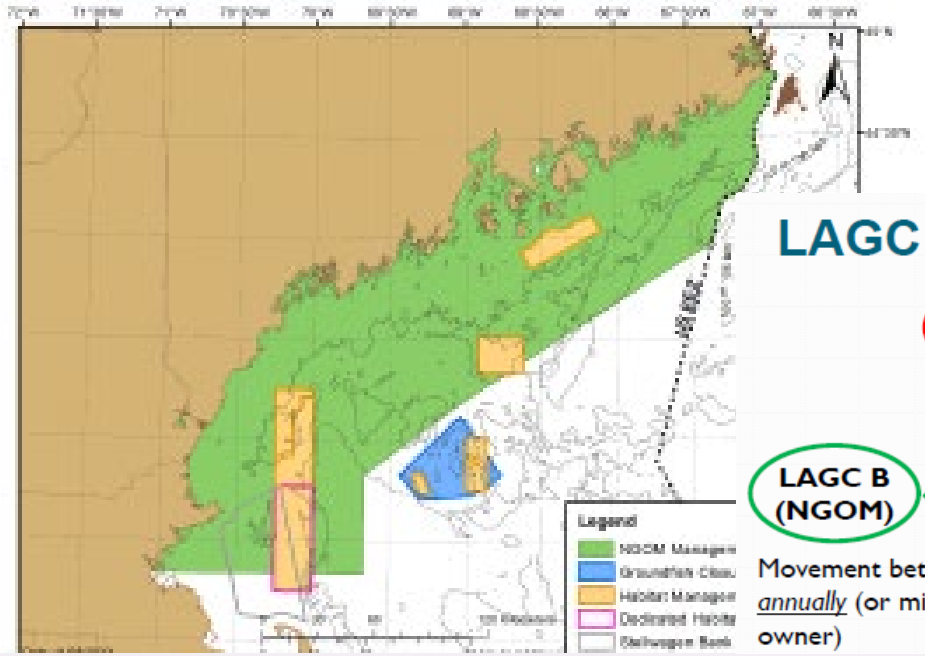


	GB cod	
	Current	FY2023
Open Season	8/1-4/30	5/1-5/31; 9/1-4/30
Minimum Size	22” – 28”	23”
Possession limit	5	5



Atlantic Sea Scallop

- **NGOM Control Date**



LAGC Permit Movement

LAGC A (IFQ)

LAGC A can do *one-time* transition to LAGC B or LAGC C

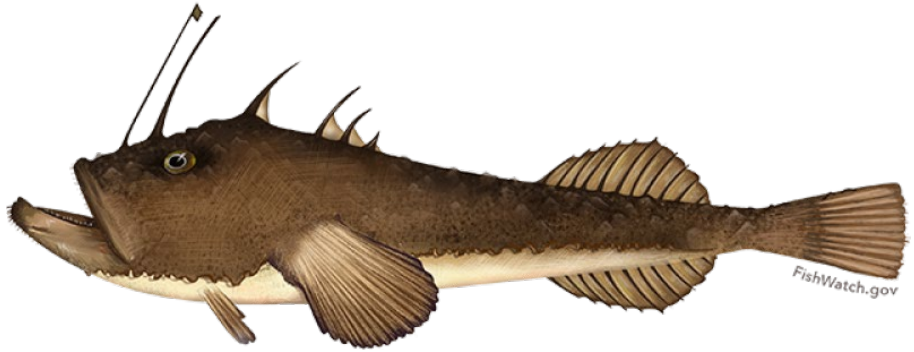
LAGC B (NGOM) ⟷ LAGC C (Incidental)

Movement between LAGC B and LAGC C allowed *annually* (or mid-season if permit is transferred to new owner)

Number of trips by GC vessels (mean, median, max), total active vessels, total number of trips, avg. catch per trip, by FY in the NGOM (data source: GARFO).

FY	Mean	Median	Max	Active vessels	Total trips	Average Catch (lbs)
2010	7	6	15	11	81	70
2011	10	4	37	10	95	62
2012	6	1	27	10	60	79
2013	27	23	101	18	483	104
2014	20	11	80	26	507	156
2015	23	16	87	30	682	131
2016	15	15	43	38	567	174
2017	7	7	18	38	278	197
2018	19	20	42	40	751	184
2019	17	18	33	45	753	190
2020	22	22	40	47	1024	170
2021	13	15	25	43	570	209
2022	27	30	50	103	2790	208

Monkfish



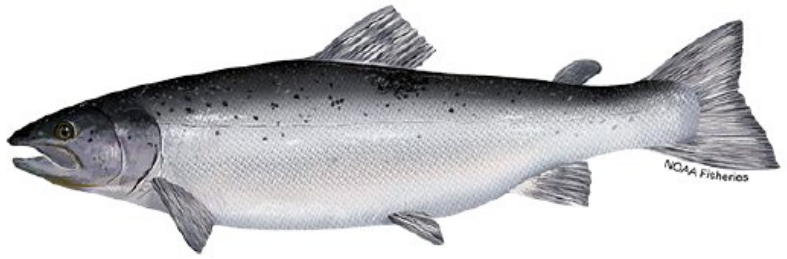
- **Finalized FW13**
  - **OFL/ABC**
  - **DAS effort controls**
  - **12” gillnet mesh**
- **Ismooth research**
- **RSA priorities**

Table 2. December 2022 NEFMC request for FY 2023-2025 ABCs.

	Northern FMA (mt)	Southern FMA (mt)
October SSC ABC recommendations	5,526	3,766
Recent ABC approach	6,923	7,956
Averages of above two rows	**6,224**	**5,861**

Habitat

Salmon Aquaculture Timeline



2023	
JAN	PDT and Committee meetings, Council update
FEB-MAR	PDT finishes drafting framework, Committee recommends preferred alternatives, Enforcement Committee review
APR	**NEFMC final action**
MAY	Formal submission
TBD	Target implementation

ECOSYSTEM-BASED FISHERY MANAGEMENT

STAKEHOLDER PERSPECTIVES

New England
Fishery Management
Council

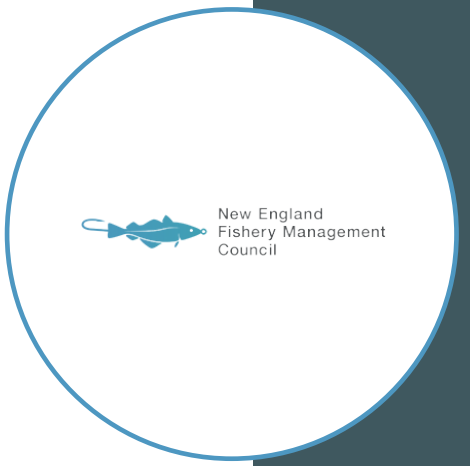
Massachusetts Division
of Marine Fisheries

Other Regional Updates

- Ropeless & Mobile Gear
- Sturgeon & Gillnets
- April Council Mtg in Mystic, CT

New England Fishery Management Council

Questions?



Potential Control Date to Address Movement of LAGC Permits between Categories

Background: At its October 27, 2022 meeting, the Scallop Committee recommended that the Council request NMFS set a control date that could be used to determine eligibility criteria for switching between LAGC permit categories and access to the Northern Gulf of Maine. The Council is scheduled to take up this Committee motion on January 24, 2023.

Motion 8: Brawn/Smith

Move that the Committee request that the Council request that the NMFS establish a control date that could be used to determine eligibility criteria for switching between LAGC permit categories in the NGOM area.

Rationale: NGOM was established with the intent of allowing the fishery to grow, and it has grown. Active participants doubled in the past year, and there was also a dramatic uptick in the switching of incidental permits to NGOM permits. There are currently over 700 permits capable of participating in the NGOM, 438 of which can switch back and forth between incidental and NGOM. This large amount of potential effort is something the Council should address. Establishing a Control Date would put people on notice that they may be treated differently if they acquire a permit or begin participating in the NGOM after that Control Date.

The motion carried 4-3-3.

What is a Control Date?

A control date is a date that may be used by a fishery management council, fisheries commission or by NOAA Fisheries in establishing eligibility criteria for determining levels of future access to fisheries, or sectors of fisheries. Establishing a control date does not commit the Councils, Commission, or NOAA Fisheries to develop any particular management system or criteria for participation in these fisheries. The Council may choose a different control date or may choose to establish a management program that does not make use of such a date. The Council's most recent control date discussion (skates, 2021) suggests a reluctance to request a control date unless there is an intent to use it in the near term.

Control date language can be specific or vague. Being very descriptive can strengthen the justification for alternatives developed in the future; however, being specific could also potentially constrain the range of alternatives that the Council may consider.

Scallop Fishery and Permit Information

The Scallop FMP was established in 1982 and specifies management measures for the scallop fishery off the New England and Mid-Atlantic coasts from Maine to Virginia. In 1994 (Amendment 4), a limited access program was created. Limited access vessels were assigned different DAS limits according to which permit category they qualified for: full-time, part-time, or occasional. Amendment 4 also created the general category scallop permit for vessels that did

not qualify for a limited access permit. Although originally created for an incidental catch of scallops in other fisheries, and for small-scale directed fisheries, the general category fishery and fleet evolved after its creation in 1994.

The general category scallop fishery was established as an "open access" fishery, any vessel that wanted to apply for a permit could; there were no specific qualifications to receive a general category permit. The main control on mortality for this component of the scallop fishery was a daily possession limit. Amendment 11, implemented in 2008, transitioned the general category component from an open access fishery to limited access. Vessels with at least 1,000 lb of landings history during a qualifying year (2000 – 2004) were eligible for an IFQ permit and "contribution factor" (allocation), while general category vessels that did not qualify for an IFQ permit were eligible for a Northern Gulf of Maine (NGOM) scallop permit, or an incidental catch permit.

Since 2008, all federal scallop permits have been limited access. A vessel can hold LA permits only, LAGC permits only, or a combination of LA and LAGC permits. There are multiple permit categories within LA and LAGC components. For the LAGC component, there are three types: LAGC Category A permits which are IFQ permits; LAGC Category B permits which are restricted to fishing in the NGOM; and LAGC Category C permits which are incidental catch permits restricted to 40 pounds of scallop catch on non-scallop trips.

The Limited Access component of the scallop fishery is primarily full-time, with a small number of part-time (PT) permits. There are no occasional (OC) permits left in the fishery (since 2009), as these were converted to part-time small dredge (PT-SMD). The LAGC IFQ component is allocated 5.5% of the total projected annual scallop landings (APL), and each permit has an individual contribution factor.

A summary of scallop permit types is shown in Table 1.

Table 1 - Scallop permit categories, qualifying criteria, harvest limits and allocation types.

Permit Type		Year Created	Action	Qualifying Criteria	Permit Category	Harvest Limits	Vessel level allocation?	Form of allocation
Limited Access[a]		1994	Amend. 4	One trip with over 400 pounds in either 1988 or 1989, extended for new vessels under construction	Based on number of days used in 1990, or average of 1985-1990 days	94.5% of APL, after set-asides and incidental catch removed	Yes	DAS and access area trips
LA General Category	**IFQ (Cat. A)**	2008	Amend. 11	Possess Open Access GC permit	1,000 pounds landings in a year (FY2000-2004), individual allocation based on best year indexed by # of years active in the fishery	5.5% of APL, after set-asides and incidental catch removed	Yes	IFQ pounds; set # AA trips at fleet level
	NGOM (Cat. B/C)	2008	Amend. 11	Possess Open Access GC permit	No landings history required	Up to NGOM Set-Aside establish in annual FWs. Trip limit of 200lbs.	No	Harvest in area until LAGC fleet reaches NGOM set-aside
	Incidental (Cat. B/C)	2008	Amend. 11	Possess Open Access GC permit	No landings history required	Deducted from APL before allocating to LA and LAGC IFQ	No	40lbs per trips. No cap. Evaluated after the fishing season.
Note: There are multiple categories of LA permits (full-time/part-time, dredge/trawl, small/large dredge).								

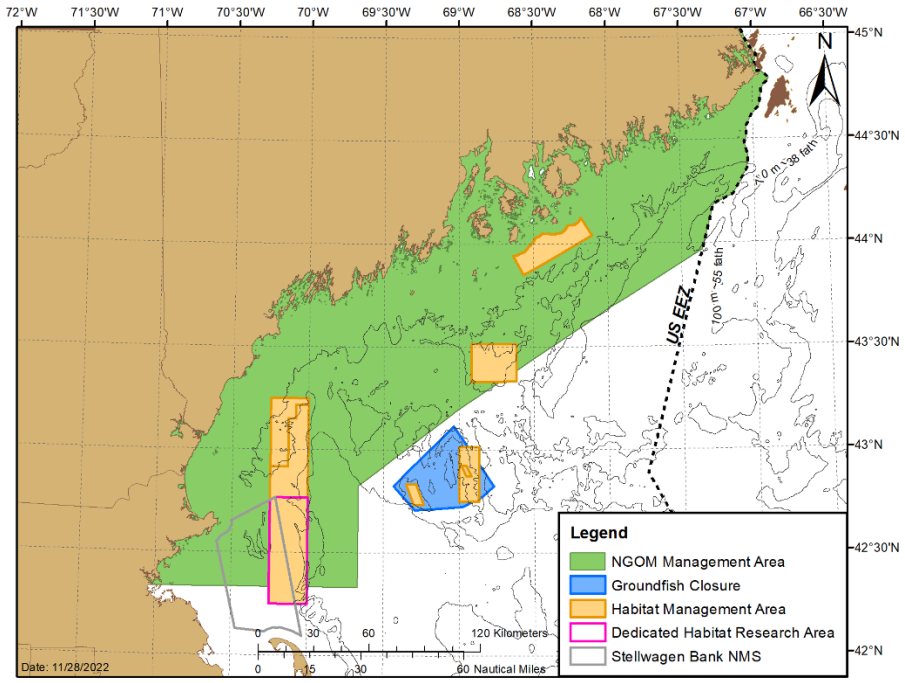
Amendment 21 Background and Purpose:

The NGOM management area (Map 1) was developed to enable continued fishing in this area while addressing concerns related to conservation, administrative burden, and enforceability of scallop fishing within the Gulf of Maine. Vessels with NGOM permits are authorized to fish within the area with a 200-pound trip limit until the annual Total Allowable Catch (TAC) for the area is caught. During development of Amendment 11 the Council did not recommend restrictions on LA vessels fishing in the NGOM because "the improved management and abundance of scallops in the major resource areas on Georges Bank and in the Mid-Atlantic region made access to Gulf of Maine scallops less important for the LA boats and General Category boats from other regions" (Amendment 11 Executive Summary; NEFMC 2007). LA vessels were able to operate in the NGOM management area under days-at-sea (DAS) if the NGOM TAC had not been harvested. The Council envisioned that management of this area would be reconsidered if the scallop population and fishery in the NGOM grew in the future.

From 2009 to 2015 the NGOM TAC was set at 70,000 pounds. During this period the TAC was not harvested and the fishery remained open for the entire year. In 2016 and 2017 there was a notable increase in effort in the NGOM management area by both LAGC and LA vessels fishing a large year class of scallops, and the area closed to all federally permitted vessels when the TAC was reached prior to the end of the fishing year. Amendment 21 was initiated partly in response to the increase in effort and landings in the NGOM area (Amendment 21, NEFMC 2022).

Amendment 21 created an arrangement that allocates to the LA and LAGC IFQ components if the available harvest is above a trigger point of 800,000 pounds. Harvest at or below 800,000 pounds is available for LAGC IFQ and NGOM permitted vessels that can harvest 200 pounds per trip.

Map 1 – The Northern Gulf of Maine management area relative to groundfish and habitat closures, dedicated habitat research areas, and the Stellwagen Bank National Marine Sanctuary.



Purpose and Need of Amendment 21

The purpose of Amendment 21 was to consider adjusting the management of the Northern Gulf of Maine to allow for more controlled access by the LA and LAGC components and increase monitoring in ways that support a growing directed scallop fishery in federal waters. Another purpose was to consider adjusting the LAGC IFQ program to support overall economic performance while allowing for continued participation in the General Category fishery at varying levels.

The need for the action was to promote conservation of the scallop resource in the Northern Gulf of Maine Management area and to manage total removals from the area by all fishery components. Another need was to expand flexibility in the LAGC IFQ fishery to reduce impacts of potential decreases in ex-vessel price and increases in operating costs (Amendment 21, NEFMC 2022).

Vision For LAGC Component

In Amendment 21, the Council reaffirmed the Amendment 11 vision statement for the Limited Access General Category component as:

> *"a fleet made up of relatively small vessels, with possession limits to maintain the historical character of this fleet and provide opportunities to various participants including vessels from smaller coastal communities."*

Goals and Objectives of Amendment 21

The goals and objectives of the Atlantic Sea Scallop FMP remained as described in earlier actions. Amendment 21 included specific goals and objectives for the management of the scallop fishery and resource in the Northern Gulf of Maine Management Area, and for the LAGC IFQ component.

Northern Gulf of Maine Management

1. Support a growing directed scallop fishery in federal waters in the NGOM.
2. Allow for orderly access to the scallop resource in this area by the LAGC and LA components.
3. Establishing mechanisms to set allowable catches and accurately monitor catch and bycatch from the NGOM.

LAGC IFQ Measures

1. Improve overall economic performance of the LAGC IFQ component.

2. Allow for continued participation in the General Category fishery at varying levels.

LAGC Permit Information

There are two kinds of LAGC permits, Category A permits (LAGC IFQ) and Category B/C. Currently, LAGC B (NGOM) and LAGC C (Incidental) permit holders can switch between these two permit categories annually, or mid-season when a permit is transferred to a new owner. LAGC A (IFQ) permit holders can make a one-time transition from IFQ to NGOM/Incidental (Category B/C).

Council staff reviewed the following information about movement between LAGC permit categories, focusing on switching permanently from LAGC A (IFQ) to LAGC B (NGOM), and switching between LAGC B (NGOM) and LAGC C (Incidental) permits.

A summary of permit movement from 2009-2022 (15 years) is shown in Table 2.

- 31 permits converted from IFQ (A) to NGOM/Incidental (B/C).
- 6 permit switches occurred within a year (i.e., when a vessel was bought/sold), 5 of which were permits that switched from C to B.
- 39 permits moved from Incidental to NGOM across years (i.e., at the time of permit renewal), with 26 permit switches in 2022. Table 4 indicates that the majority of the switches in 2022 were by LA vessels that also hold LAGC B/C permits. There were 4 LA vessels with LAGC NGOM permits that took NGOM trips in 2022.
- 4 moved from NGOM to Incidental across years (i.e., at the time of permit renewal).
- The geographic distribution of LAGC NGOM permits is shown in Table 6. The majority of NGOM permits are issued to vessels homeported in Maine and Massachusetts.

The number of LAGC IFQ (A) permits with zero base allocation are shown in Table 3. The number of LAGC IFQ (A) permits with zero allocation has varied annually but has shown an

increasing trend over time, from 7 permits in 2011 to 102 permits in 2022. There were a total of 323 LAGC IFQ permits as of October 21, 2022, meaning roughly 32% of LAGC IFQ permits in existence had zero base allocation at that time.

Table 2 - Summary of LAGC conversions and switches between FY 2008 and FY 2022. Data are from NMFS/GARFO, August 11, 2022.

Year	Conversion from A to B/C	From B to C Within a year	From C to B Within a year	From B to C Across Years	From C to B Across Years
2008	-	-	-	-	-
2009	0	0	0	0	3
2010	0	0	0	0	1
2011	1	0	0	0	0
2012	1	0	0	2	2
2013	2	0	0	0	0
2014	6	1	1	1	0
2015	0	0	2	0	0
2016	0	0	0	0	0
2017	3	0	0	0	1
2018	3	0	0	0	1
2019	2	0	1	0	1
2020	4	0	0	1	2
2021	6	0	1	0	2
2022	3	0	0	0	26
Total	31	1	5	4	39

Table 3 - Number of Scallop LAGC IFQ (A) MRIs with zero base allocation, FY2011 – FY2022 (source: GARFO).

FY	MRI	Annual Change
2011	7	
2012	5	-2
2013	28	23
2014	46	18
2015	49	3
2016	66	17
2017	88	22
2018	87	-1
2019	94	7
2020	104	10
2021	107	3
2022	102	-5

Table 4 – LAGC permits held by LA vessels. (source: GARFO)

CALENDAR_YEAR	'LA+IFQ'	'LA+NGOM'	'LA+INCI'
2009	41	26	112
2010	40	27	113
2011	40	27	113
2012	41	27	111
2013	38	27	112
2014	40	27	113
2015	40	27	113
2016	40	27	113
2017	40	27	113
2018	40	26	113
2019	40	26	114
2020	40	27	113
2021	39	28	110
2022	41	53	89

Table 5 - Number of LAGC Category B permits issued to vessels, 2010 - 2022. Data from NMFS/GARFO, August 11, 2022.

Fishing Year	Total Cat B Permits
2010	105
2011	97
2012	90
2013	92
2014	90
2015	90
2016	93
2017	95
2018	99
2019	102
2020	109
2021	125
2022	158

Table 6 – Number of LAGC Category B permits issued to vessels in 2022 by homeport state. Data from NMFS/GARFO, August 11, 2022

State	Cat. B Permits
MA	74
ME	66
NC	5
NH	6
NJ	4
Other	4

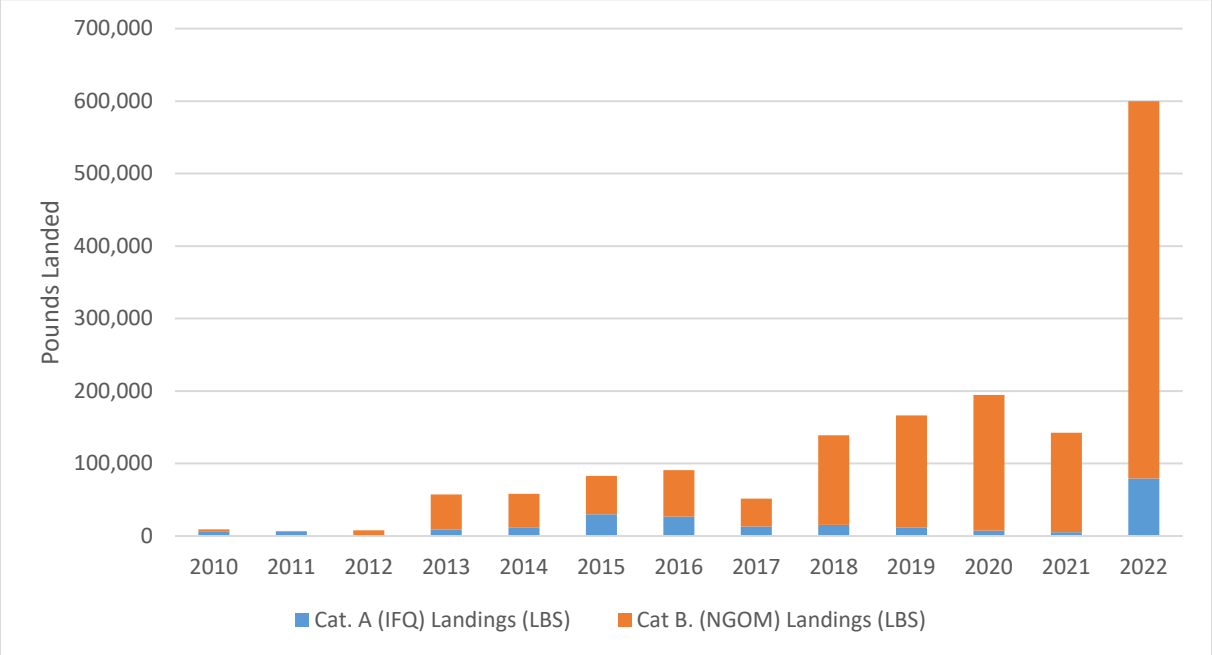
Northern Gulf of Maine Fishery Data

The 2022 fishing year marked the first NGOM season under new management measures adopted through Amendment 21 to the Scallop FMP. Data on participation and landings in the NGOM area by LAGC permit type since 2010 is provided below in Table 7. Participation increased substantially in 2022 coinciding with the increased TAL following the re-opening of Stellwagen Bank after a two year closure (Figure 1).

Table 7 - Number of LAGC Cat. A and Cat. B permits with declared trips to NGOM, 2010 - 2022.

Fishing Year	LGC A (IFQ	LGC B (NGOM)
2010	6	5
2011	6	4
2012	3	6
2013	7	11
2014	7	17
2015	8	20
2016	11	25
2017	10	26
2018	6	34
2019	6	39
2020	3	43
2021	5	44
2022	28	73

Figure 1 – NGOM landings by permit type (Cat A & Cat B) 2010- 2022. Source: NMFS, August 1, 2022.



Example Control Date Timeline

An example timeline for setting a control data that limits LAGC permit movement is shown in Table 8. Note that it is required that the public be noticed two weeks in advance of a Council meeting where a control date is being considered. If the Council does move to set a control date, the control date would be set to the day the notice publishes in the Federal Register (approximately 2 months following a Council vote). Should the Council request that NMFS

establish a control date at the January 2023 meeting, it is likely that the notice would publish prior to the start of fishing year 2023 (April 1, 2023).

Table 8 - Example timeline if the Council requests that NMFS establish a control date at the January 2023 meeting.

Date	Action
27-Oct-22	Committee recommends that the Council consider a control date for LAGC permit movement at the December 2022 meeting.
10-Jan-23	FR notices that the Council will be considering a control date at January 2023 meeting
24-Jan-23	Council requests NMFS establish control date for LAGC permit movement.
Mar-23	FR publishes advanced notice of proposed rulemaking, establishing the control date. The control date is set for the same day as the FR publishes advanced notice of proposed rulemaking (ANPR).
1-Apr-23	FY2023 begins, NGOM fishery opens

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December 12, 2022

Michael Pentony
Regional Administrator
NOAA Fisheries Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930

Dear Mr. Pentony,

I am writing you to share two concerns I have regarding the federal coordination of the Atlantic Large Whale Take Reduction Plan (ALWTRP) rule-making to reduce the risk of serious injury and mortality to the North Atlantic right whale ("NARW"). I hope you can consider and address these concerns this winter and as ALWTRP rule making progresses over the course of the next two years.

1. Spatial Gaps Between State and Federal Trap Gear Closures for the Massachusetts Restricted Area

I wrote to you on this subject on January 7, 2022. In this letter, I expressed my concerns regarding the seasonal entanglement risk for the NARW in the EEZ west of Stellwagen Bank and informed NOAA Fisheries there is a portion of federal waters within the Gulf of Maine that remains open to trap fishing and the use of persistent buoy lines and is sandwiched between Massachusetts' February 1 – May 15 Commercial Trap Gear Closure to Protect Right Whales [322 CMR 12.04] and the federal February 1 – April 30 Massachusetts Restricted Area Closure.

This spatial gap between state and federal closures poses a substantial and unnecessary entanglement risk to NARW. Having this near-shore area remain open to trap gear fishing and persistent buoy lines when adjacent state and federal waters are closed creates an opportunity for federally permitted vessels to fish or store buoyed trap gear in the area. Since 2018, sightings data indicate that NARW are being increasingly observed in state and federal waters in Massachusetts Bay and north towards the New Hampshire coastline. The combined effect is a documentable seasonal co-occurrence between NARW and buoyed trap gear, particularly during April and May when right whales begin to seasonally migrate out of Cape Cod Bay (Figure 1). I am concerned this continued overlap of buoyed trap gear with aggregations of NARW could result in an entanglement in waters off Massachusetts' coast that could threaten the viability of Massachusetts' fixed gear fisheries moving forward.

NOAA Fisheries was responsive when I raised this issue back in January and you pursued an emergency rule to close the so-called Massachusetts Restricted Area Wedge from April 1 – April 30 in 2022. The Massachusetts Restricted Area Wedge was inclusive of those federal waters west of 70° 30' west longitude between 42° 12' N latitude to the south and 42° 39.77' N latitude to the north. I commend you for taking this important action.

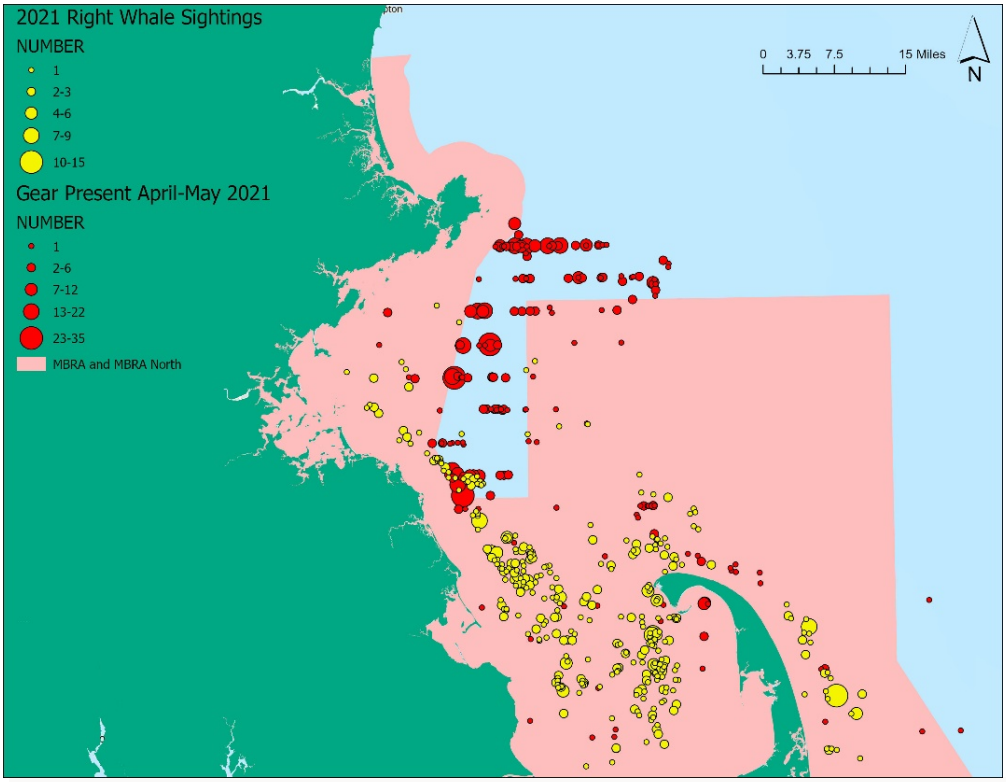

Figure 1. Right whale sightings in 2021 and buoy lines documented in April and May 2021 (CCS data)

During the course of 2022, NOAA Fisheries did not pursue interim rule-making to make permanent the emergency closure of the Massachusetts Restricted Area Wedge. As a result, in 2023, this area will again be open to federally permitted vessels to fish or store buoyed trap gear during the late winter and early spring months. I encourage NOAA Fisheries to consider the entanglement risk posed by spatial gaps in seasonal buoyed trap gear closure coverage. Moreover, I strongly support NOAA Fisheries re-closing the Massachusetts Restricted Area Wedge—similar to this past year—for 2023 and 2024, or until the new ALWTRP rules are implemented.

2. Enhanced Coordination in ALWTRP Rule Making Within NOAA Fisheries and with the Councils

As a result of the recent Boasberg decision, NOAA Fisheries has initiated a two-year rule making process to reduce the risk of NARW entanglements in regulated fisheries by 90% coastwide in order to achieve PBR. This presents a substantial and unprecedented conservation challenge. The breadth of this rule-making endeavor is considerable and it expands across

various fisheries and gear types. Moreover, some potential outcomes may have indirect impacts on fisheries not regulated under the ALWTRP. Accordingly, NOAA Fisheries should enhance coordination regarding ALWTRP rule-making efforts between its Protected Resources Division and its Sustainable Fisheries Division and with the New England and Mid-Atlantic Fishery Management Councils.

There is substantial overlap between what the TRT is discussing and considering and the work being conducted by the Sustainable Fisheries Division. In my experience, there can be a disconnect between the two programs. For instance, there are legacy fisheries—where effort and participation is tightly controlled at the state and federal levels (e.g., lobster trap)—that are required to substantially cut how they conduct their fishing activities to address NARW entanglement risk. Meanwhile, there are limited federal controls on the proliferation of new fixed gear fishing effort (e.g., waved whelk pot, black sea bass pot) in the federal zone that increase the presence of persistent buoy lines in the water column and subsequent risk to NARW. This disconnect complicates management and hurts NOAA Fisheries credibility with stakeholders.

To this point, I was encouraged that staff from the Sustainable Fisheries Division attended the recent ALWTRP industry scoping meeting with the southern New England gillnet fleet. There is overlap between the management of the skate, monkfish, and groundfish fisheries in the region and the management of this gillnet fishery with regards to NARW entanglement risk. Having staff from both divisions present made for a more robust and informed dialogue. More deliberate coordination among NOAA Fisheries staff is necessary and appropriate to comprehensively address the robust challenge the TRT currently faces.

Similarly, there should be vigorous coordination between NOAA Fisheries and the New England and Mid-Atlantic Fishery Management Councils. There are certain management measures that may achieve risk reduction that are outside the purview of the TRT and require Council action. For instance, the southern New England monkfish and skate gillnet fleet expressed interest in addressing latent effort as a means of reducing entanglement risk and this would require the Council to amend the relevant fishery management plans.

However, the most important place for coordination between the ALWTRP rule making process and the Councils is with regards to the potential use of on-demand buoy line systems ("ropeless fishing") and or alternatively, using only one buoy line on multi-trap trawls. If these types of trap fishing activities are going to be authorized or mandated in the federal zone, there will be a proliferation of trap gear without surface markings. This substantially increases the likelihood of gear conflicts and poses a significant additional safety risk to commercial fishers whose gear may become hung-up on this unmarked gear. To avoid such gear conflicts, I anticipate the New England and Mid-Atlantic Fishery Management Councils are going to have to take actions across a variety of federally managed fisheries prosecuted by mobile gear to require vessels be equipped with technology to determine the presence unbuoyed trap gear.

On a similar but unrelated matter, the draft Sturgeon Action Plan to reduce bycatch in gillnet fisheries warrants similar coordination across NOAA Fisheries, and with the Councils, as well as the Atlantic States Marine Fisheries Commission.

Thank you for your time reviewing my concerns. Please let me know if there is any way for the Massachusetts Division of Marine Fisheries to further assist NOAA Fisheries in meeting this critical and considerable management challenge.

Best regards,

Daniel J. McKiernan, Director
Massachusetts Division of Marine Fisheries

cc: Massachusetts Marine Fisheries Advisory Commission; Massachusetts Department of Fish and Game; New England Fishery Management Council; Mid-Atlantic Fishery Management Council

Enc: January 7, 2022 letter from DMF to GARFO

The Commonwealth of Massachusetts
Division of Marine Fisheries
251 Causeway Street, Suite 400, Boston, MA 02114
p: (617) 626-1520 | f: (617) 626-1509
www.mass.gov/marinefisheries

December 12, 2022

Michael Pentony
Regional Administrator
NOAA Fisheries Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930

Dear Mr. Pentony,

I am writing you to share two concerns I have regarding the federal coordination of the Atlantic Large Whale Take Reduction Plan (ALWTRP) rule-making to reduce the risk of serious injury and mortality to the North Atlantic right whale ("NARW"). I hope you can consider and address these concerns this winter and as ALWTRP rule making progresses over the course of the next two years.

1. Spatial Gaps Between State and Federal Trap Gear Closures for the Massachusetts Restricted Area

I wrote to you on this subject on January 7, 2022. In this letter, I expressed my concerns regarding the seasonal entanglement risk for the NARW in the EEZ west of Stellwagen Bank and informed NOAA Fisheries there is a portion of federal waters within the Gulf of Maine that remains open to trap fishing and the use of persistent buoy lines and is sandwiched between Massachusetts' February 1 – May 15 Commercial Trap Gear Closure to Protect Right Whales [322 CMR 12.04] and the federal February 1 – April 30 Massachusetts Restricted Area Closure.

This spatial gap between state and federal closures poses a substantial and unnecessary entanglement risk to NARW. Having this near-shore area remain open to trap gear fishing and persistent buoy lines when adjacent state and federal waters are closed creates an opportunity for federally permitted vessels to fish or store buoyed trap gear in the area. Since 2018, sightings data indicate that NARW are being increasingly observed in state and federal waters in Massachusetts Bay and north towards the New Hampshire coastline. The combined effect is a documentable seasonal co-occurrence between NARW and buoyed trap gear, particularly during April and May when right whales begin to seasonally migrate out of Cape Cod Bay (Figure 1). I am concerned this continued overlap of buoyed trap gear with aggregations of NARW could result in an entanglement in waters off Massachusetts' coast that could threaten the viability of Massachusetts' fixed gear fisheries moving forward.

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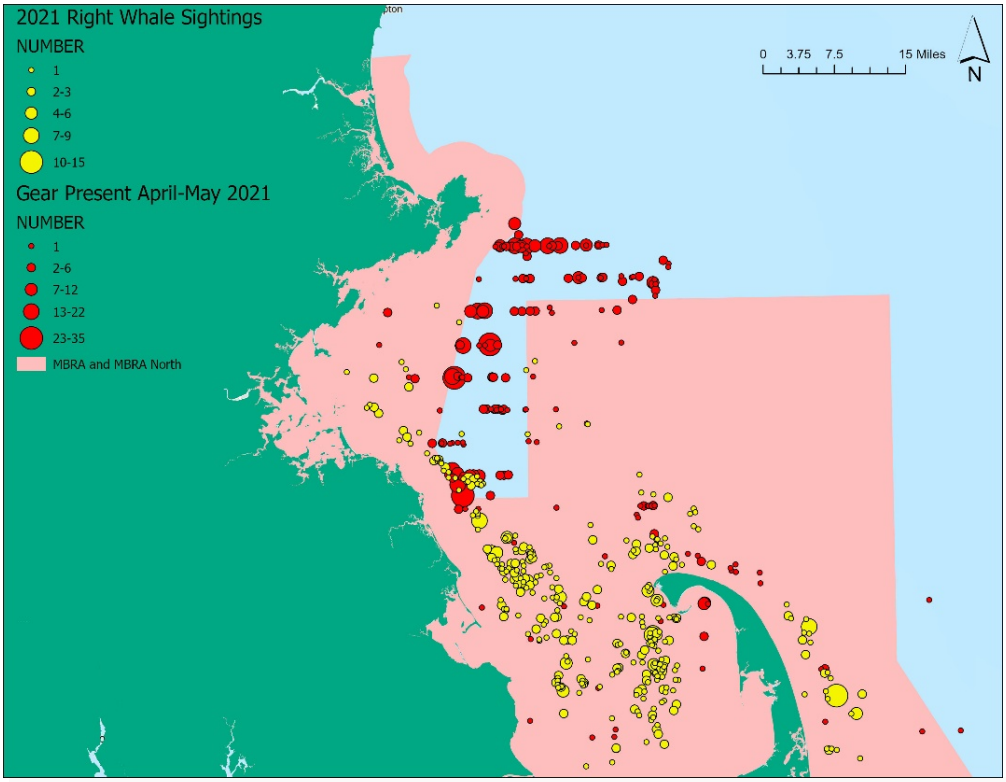

Figure 1. Right whale sightings in 2021 and buoy lines documented in April and May 2021 (CCS data)

During the course of 2022, NOAA Fisheries did not pursue interim rule-making to make permanent the emergency closure of the Massachusetts Restricted Area Wedge. As a result, in 2023, this area will again be open to federally permitted vessels to fish or store buoyed trap gear during the late winter and early spring months. I encourage NOAA Fisheries to consider the entanglement risk posed by spatial gaps in seasonal buoyed trap gear closure coverage. Moreover, I strongly support NOAA Fisheries re-closing the Massachusetts Restricted Area Wedge—similar to this past year—for 2023 and 2024, or until the new ALWTRP rules are implemented.

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Thank you for your time reviewing my concerns. Please let me know if there is any way for the Massachusetts Division of Marine Fisheries to further assist NOAA Fisheries in meeting this critical and considerable management challenge.

Best regards,

Daniel J. McKiernan, Director
Massachusetts Division of Marine Fisheries

cc: Marine Fisheries Advisory Commission; Department of Fish and Game; New England Fishery Management Council; Mid-Atlantic Fishery Management Council

Enc: January 7, 2022 letter from DMF to GARFO

The Commonwealth of Massachusetts
Division of Marine Fisheries

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CHARLES D. BAKER, Governor | KARYN E. POLITO, Lt. Governor | KATHLEEN A. THEOHARIDES, Secretary | RONALD S. AMIDON, Commissioner | DANIEL J. MCKIERNAN, Director

January 7. 2022

Michael Pentony
Regional Administrator
NOAA Fisheries GARFO
55 Great Republic Drive
Gloucester, MA 01930

RE: Seasonal entanglement risk for North Atlantic Right Whales in the EEZ west of Stellwagen Bank

Dear Mr. Pentony,

I am writing to inform you of an emerging entanglement risk to North Atlantic right whales (NARW) that occurs in a certain zone of federal waters sandwiched between the state and federal closures.

As you are aware, NOAA Fisheries created the Massachusetts Restricted Area (MRA) in 2015 to reduce the risk of entanglement risk to the large aggregations of NARW that occur there seasonally. This closure to fixed fishing gear included MA state waters within Cape Cod Bay and adjacent federal waters around Stellwagen Bank from February 1st through April 30th of each year. DMF immediately created analogous state regulations closing the area to fixed fishing gear.

Since 2016, DMF has also added dynamic management to the state waters portion of the MRA by extending the closure into the month of May when aerial surveillance shows that right whales remain present. In addition to this action, since the beginning of the closure, DMF has engaged in efforts, with assistance from the Massachusetts Environmental Police, to retrieve abandoned gear in the closure annually to ensure that the entanglement risk to right whales is effective as intended.

Since the advent of the MRA closure in 2015, seasonal usage of state and federal waters outside of Cape Cod Bay increased in certain areas and times where fixed gear fishing was allowed. Recent sighting data indicate that NARW stay for a longer time period than they have historically, and these whales are increasingly observed in state and adjacent federal waters in Massachusetts Bay and north to the NH state line. These changes in distribution increased the entanglement risk to NARW along the MA coastal waters. In response to these changes in entanglement risk, as well as continued declines in the population status of NARW, in 2021 DMF closed MA state waters from southeastern Cape Cod north the NH border to lobster fishing from February 1st to May 15th (Figure 1).

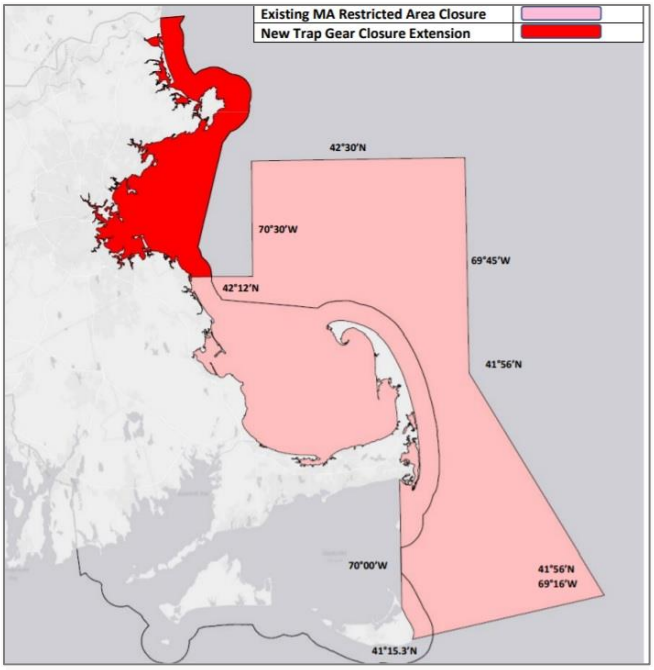


Figure 1. DMF trap/gear closure, February 1 – May 15

The National Marine Fisheries Service then mirrored the northern extension of the closure, known as Massachusetts North Restricted Area, in their Phase 1 amendment to the Atlantic Large Whale Take Reduction Plan in September of 2021. The Massachusetts North closure only runs through April 30 each year under the federal plan (Figure 2).

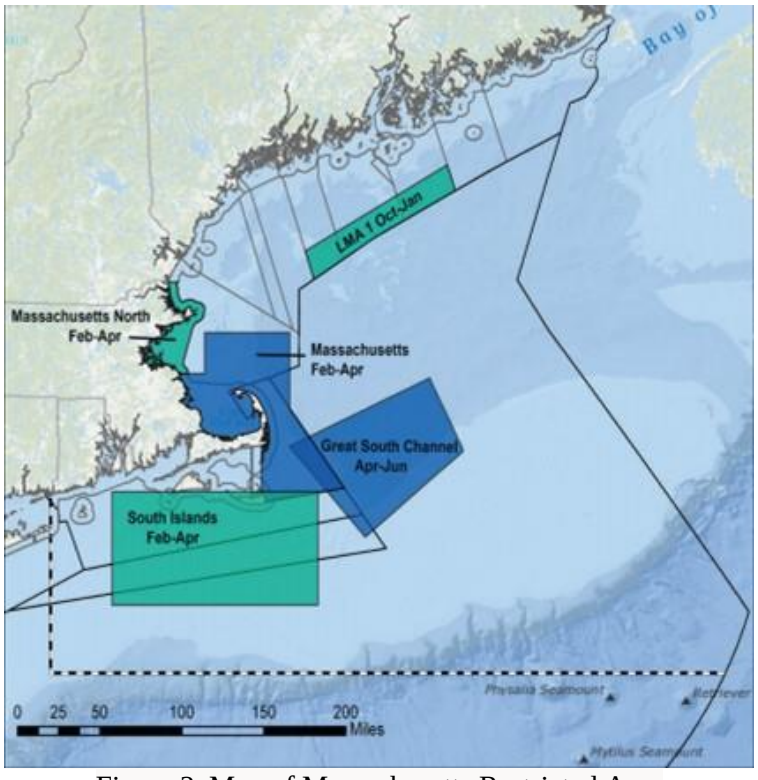


Figure 2. Map of Massachusetts Restricted Area

The increasing presence of NARW in these northern areas is not exclusive to state waters. In recent years, aerial surveillance conducted by the Center for Coastal Studies (CCS) has documented the presence of right whales in both open and closed portions of the waters north of Cape Cod Bay. The map below depicting gear and whales from 2018 demonstrates the necessity for DMF's northern extension of the state waters closure implemented in 2021 (Figure 3).

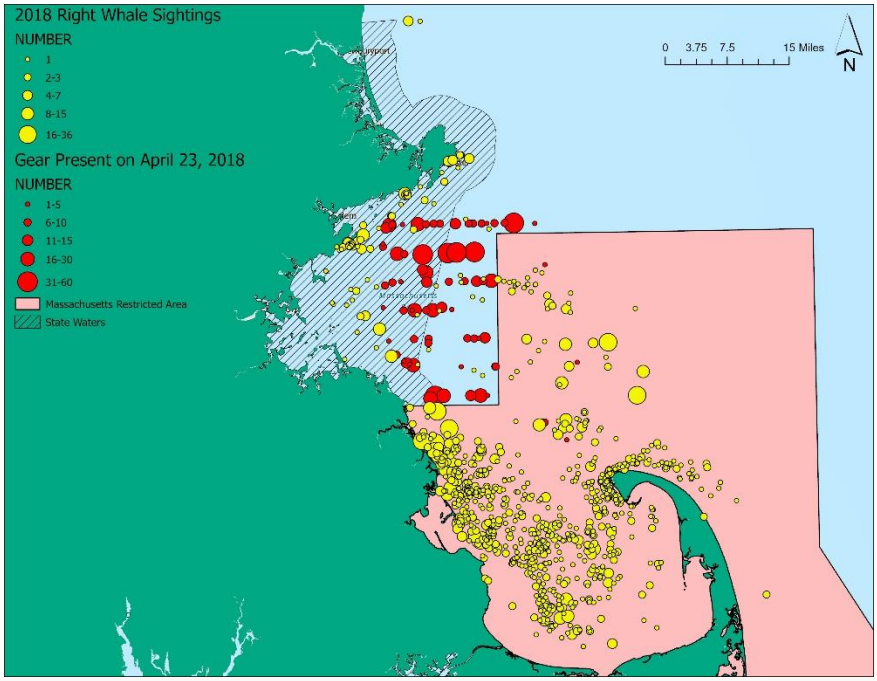


Figure 3. Right whale sightings in 2018 and buoy lines documented on April 23, 2018

However, the implementation of the Massachusetts North Restricted Area has created a gap between the closed areas between state waters of Massachusetts Bay and the northern federal waters portion of the original Massachusetts Restricted Area (Figure 2 and 4). Federally permitted vessels can continue to fish with persistent buoy lines in these areas adjacent to MA state waters during the closure period, and this area lies beyond the jurisdiction of the Commonwealth.

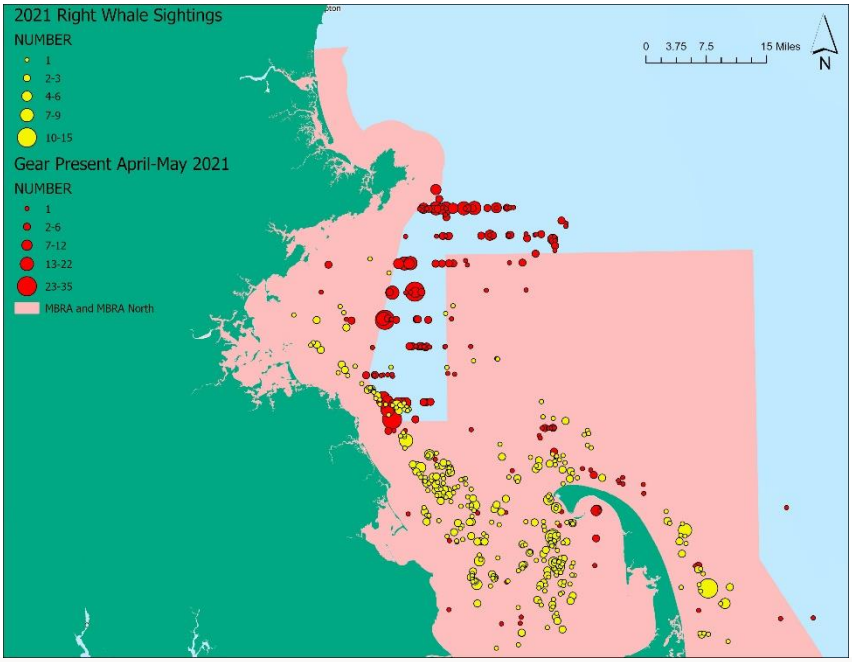


Figure 4. Right whale sightings in 2021 and buoy lines documented in April and May 2021

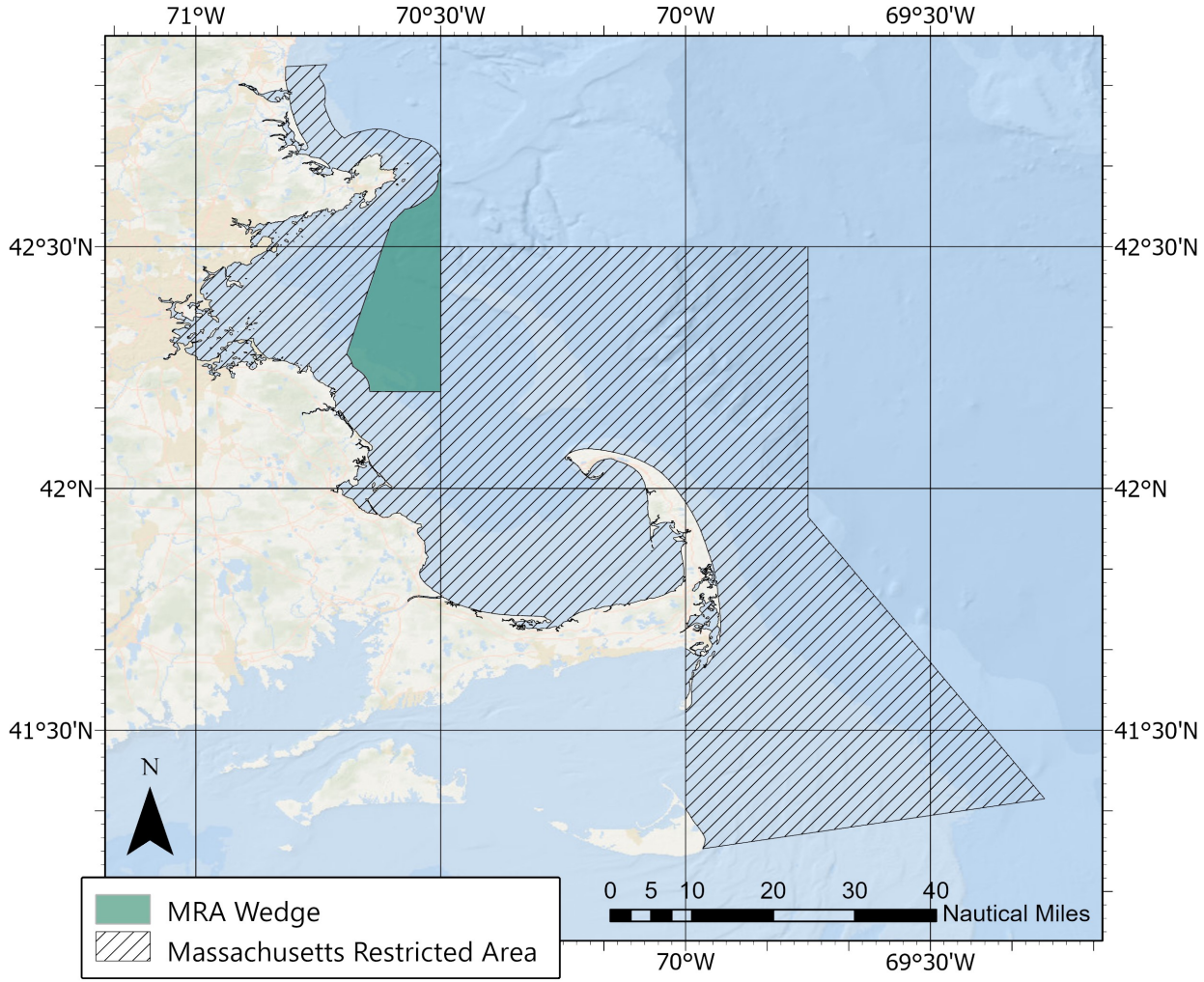
Given the current dire status of the NARW population and the need for continued reductions in entanglement risk we wanted to ensure that NOAA Fisheries was aware of this issue. We feel that continued overlap of persistent buoy lines with aggregations of NARW pose an entanglement threat and we are concerned that any future NARW entanglement in waters off the Massachusetts coast could threaten the opportunity of MA-based fishers to participate in fixed gear fisheries.

Sincerely,

Daniel J. McKiernan, Director

CC: Marine Fisheries Advisory Commission

MA Restricted Area and Wedge



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MAURA T. HEALEY, Governor | KIMBERLEY DRISCOLL, Lt. Governor | REBECCA L. TEPPER, Secretary | RONALD S. AMIDON, Commissioner | DANIEL J. MCKIERNAN, Director

LETTER OF AUTHORIZATION AND STATEMENT OF PERMIT CONDITIONS
To Experiment with Ropeless Lobster Gear in Massachusetts Waters

Eric Matzen
NOAA NEFSC
166 Water St
Woods Hole, MA 02543

February 9, 2023

Vessels:

Joseph Barrow
28 Elm Court
Cohasset, MA 02025
F/V Ryan Joseph
Doc #: 968046
Permit ID#: 002659

Christopher Stowell
370 Old Westport Rd
N. Dartmouth, MA 02747
F/V Jim Dandy
Doc # 575437
Permit ID# 002532

Michael Lane
280 Gannett Rd
Scituate, MA 02066
F/V Phyllis P
Doc # 1090177
Permit ID# 000126

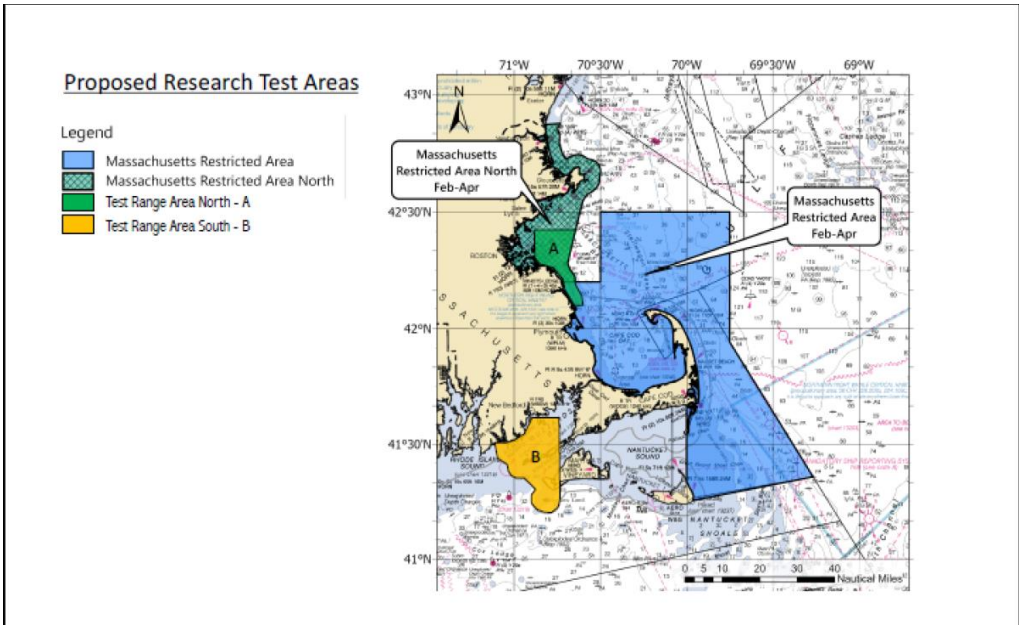
Peter Mason
16 Dorothy Rd
Plymouth, MA 02360
F/V Kestrel
Doc #: 947399
Permit ID#: 002543

Tobias Mason
16 Dorothy Rd
Plymouth, MA 02360
F/V Pot Luck
Doc #: 1112287
Permit ID#: 002232

Principal Investigator:
Henry Milliken
NOAA NEFSC
166 Water St
Woods Hole, MA 02543

This Letter of Authorization and Statement of Permit Conditions (LOA) is issued pursuant to the authority at M.G.L. c. 130 § 80 and 322 CMR 7.01(7). This authorization is valid from February 10, 2023 through May 15, 2023, or when the Division of Marine Fisheries lift the state waters closure.
The purpose of this LOA is to accommodate work being conducted by NOAA Fisheries' Northeast Fisheries Science Center Gear Research Team and federally permitted commercial lobster vessels to test on-demand ("ropeless") fishing in discrete areas within state and federal waters. Accordingly, DMF hereby exempts commercial fishing permits Permit ID # 002659 (F/V Ryan Joseph, Documentation # 968046), Permit ID # 002532 (F/V Jim Dandy, Vessel Documentation #575437), Permit ID # 000126 (F/V Phyllis P, Vessel Documentation # 1090177), Permit ID # 002543 (F/V Kestrel, Vessel Documentation # 947399), and Permit ID # 002232 (F/V Pot Luck, Documentation # 1112287) from the trap gear marking requirements at 322 CMR 12.06 and the commercial trap gear closure to protect right whales at 322 CMR 12.04(2), provided the vessels deploy non-conforming lobster trap gear in accordance with the enumerated Statement of Permit Conditions below, which are enforceable by law.

- Lobster trap trawls will be set using only on-demand gear. No persistent vertical buoy lines are allowed.
- The gear can only be fished within the two designated research test areas depicted in the attached map.
- All permitted fishers participating in the study will be required to submit supplemental catch logs weekly to DMF on forms provided by the agency. These logs must include data on the number of lobsters harvested; number of lobsters discarded; number of traps hauled; and location of all traps hauled; amount and location of any gear lost.
- All participating fishers must agree to use a vessel tracker system, if and when, requested by DMF. DMF will supply the vessel tracker system.
- DMF reserves the right to suspend activities at any time should unacceptably large aggregations of North Atlantic right whales be observed in either of the proposed study areas resulting in the enhanced risk of a take.
- All participating fishers shall adhere to the following best practices and risk management measures;
    - On demand vertical lines will contain unique markings above the regional requirements. Yellow/black/orange twine marks will be placed above regional markings on hauling lines.
    - A unique flag will be flown by each vessel for enforcement recognition.
    - Enforcement will be contacted, prepped, and provided with Trap Tracker prior to the start of the trial.
    - After release, the on-demand vertical line will be retrieved as quickly as possible to minimize time in the water column.
    - Visual right whale sightings will be recorded on data sheets when in a fishing area.
    - Project vessels will operate within a 10-knot speed limit at all times in the Massachusetts Restricted Area.
    - Project vessels must adhere to federal approach regulations- 500 yards (1500 ft.) buffer zone created by a surfacing right whale and must depart immediately at a safe and slow speed, in accordance with current regulations.
    - If a right whale comes within 500 yards of the vessel, hauling any lobster gear would immediately cease, by either removal or resetting, to accommodate the approach regulation and be reinitiated only after it was reasonable to assume the whale had left the area.
    - Trap Tracker or an equivalent application will be utilized for retrieval and set positioning details and available to Federal, State and corresponding enforcement personnel.
- A final report summarizing all data collected, along with any findings shall be submitted within 90 days of the conclusion of the study.



This authorization is valid from February 9, 2023 through May 15, 2023 (subject to any adjustments to the Massachusetts Restricted Area closure) unless sooner revoked for cause.

Daniel J. McKiernan, *Director*

Walter Kelly and James Hebert
The Dartmouth Saltwater Anglers
80 Middle Street
Fairhaven, MA 02719
11/16/22

Mr. McKiernan
Director of Marine Fisheries
Mass DEP
251 Causeway Street
Suite 400
Boston, MA 02114

Dear Mr. McKiernan:
The Dartmouth Saltwater Anglers are requesting that the policies for regulating the Black Sea Bass trawl industry be examined as to their impact on the Tautog fishery in our local waters. In our opinion the damage has been unaddressed, and historically tolerated, as Tautog by-catch are continuously killed by the current practices. Informal surveys by our organization have led to the trawl fishermen admitting that they see large numbers of Tautog in their trawls with very few of them surviving the haul to the surface. We are greatly alarmed by the decrease of the species in the last decade and are hopeful that through regulation and management the fishery can regain its health.

We would ask that the possible solutions are considered:

- Reduce the opening sizes of the traps to prevent fish over 3 ½ to 4 ponds from entering
- Suspend all Tautog licenses from active trawl fishermen
- Reducing the overall numbers of allowed trawls allowed

Thank you for your time we look forward to your feedback.

Sincerely,

Walter Kelly and James Hebert

Dartmouth Saltwater Anglers

From: McKiernan, Dan (FWE)
To: Silva, Jared (FWE); Kaplan, Julia (FWE)
Subject: FW: Bass 2023
Date: Monday, February 6, 2023 1:05:43 PM

From: Jack Skammels <whamajama@hotmail.com>
Sent: Sunday, February 5, 2023 4:23 PM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Bass 2023

To : Mr. Daniel McKiernan
From: John Skammels
Dear Mr. McKiernan

Please consider this recommendation for the 2023 Massachusetts striped bass season.

An earlier opening in 2023 would include the commercial fisherman of westport ,buzzards bay ,cuttyhunk , and marthas vineyard Massachusetts area to have equal access to the commercial harvest of striped bass. With the current rise in water temps the easterly section of buzzards bay and vineyard sound have little or no chance of making a daily quota with the opening day set in mid june,.forcing the retail market to buy striped bass from Rhode Island where the opening of the commercial season opens in may. It seems obvious to me that the advisory board consisting of members who have an interest in areas
North of the canal have controlled the decision of the date to open the commercial bass season... conflict of interest? Massachusetts Restaurants are forced to buy from RI until mid June... why ,? The fish are available to catch in the buzzards Bay, vineyard sound area starting historically in may.. why are we declined to catch and sell untill mid june... please consider our request to be included in an earlier mass striped bass commercial season for 2023. Thank you..
Jack Skammels.
Sincerely:
75 Hillcrest Acres
Westport,Mass 02790
Whamajama@hotmail.com
#134962
#163057

From:	McKiernan, Dan (FWE)
To:	Lynch, John (SEN)
Cc:	Jack Skammels; Silva, Jared (FWE); Reed, Story (FWE); Raymond Kane; Buchan, Nick (FWE); Webb, Anna (FWE); Meserve, Nichola (FWE); Glenn, Robert (FWE); Kaplan, Julia (FWE); Amidon, Ronald (FWE); McClanan, Noah (FWE)
Subject:	RE: Senator Rodrigues Aide Intro
Date:	Monday, February 6, 2023 1:46:32 PM
Attachments:	6_Commercial Striped Bass Proposal.pdf 6_Commercial Striped Bass SubCommittee Meeting Summary_21Dec20.pdf 5_Commercial Striped Bass Limit Adjustment Proposal.pdf

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Greetings John and John

I received John Skammels' e-mail over the weekend requesting an earlier start date for the commercial striper fishery and spoke with you, John lynch, today about the past rulemaking concerning the striped bass commercial season and the start date.

DMF and the Marine Fisheries Advisory Commission addressed substantial amendments to our commercial fishery in 2021. At the time we were not fully utilizing our commercial quota and we were seeking regulatory amendments to enhance the commercial catch of striped bass. To address the concerns of Westport area fishermen we did open the fishery a week earlier by moving the start date from June 23rd to June 16th. A more substantive change was increasing the number of days per week for commercial fishing from 2 to 3 and we made those days consecutive: Monday Tuesday and Wednesday, to enhance the efficiency of the commercial fishing operations. The changes that we accomplished have been highly successful. This year our commercial quota closed for the season on August 3rd, and truthfully this closure date is on the early side if our goal is to enhance economic revenue because historically ex-vessel prices are higher during the summer tourist months when the demand for local seafood peaks. I, the Commission, and the fishery participants (dealers and commercial fishermen) are unlikely to embrace proposals that could result in an even earlier closure date than what we experienced in 2022.

During our last round of rulemaking, we met with fishery participants and dealers. We also convened a subcommittee of the Commission, and we held a statewide public hearing on these issues. I am comfortable with the outcome of our past rulemaking and I feel that the June 16th date was an effective compromise that met the needs of the maximum a number of fishery participants across the state.

For the upcoming spring public hearings we have many issues that are extremely challenging and time-consuming and the striped bass fishery is not among them this year. This year's hot topics include horseshoe crab fishery management, menhaden quota management, summer flounder commercial quota management and recreational scup and black sea bass limits. Simply put, we are fully occupied with the challenges of those fisheries regulations amendments and can't dedicate staff time to striped bass proposals this year. It takes us up to 6 months to accomplish a regulations change which is the time required to analyze available date to determine the expected outcome of new proposals, prepare the proposals, conduct public hearings and then meet the administrative procedures required under state law and executive orders. We have been already working on those other aforementioned issues for almost three months hoping to accomplish rule changes in time for the upcoming fishing season.

I have included a series of documents that capture our previous rulemaking processes and outcome. I and my staff am willing to discuss this with you informally further if you wish.

Dan McKiernan, Director

From: Lynch, John (SEN) <john.lynch@masenate.gov>
Sent: Monday, February 6, 2023 10:30 AM
To: McKiernan, Dan (FWE) <dan.mckiernan@mass.gov>
Subject: Senator Rodrigues Aide Intro

Good morning, Director McKiernan,
I am Senator Rodrigues new legislative aide, John Lynch. I look forward to working with you on the issues of Marine Fisheries. One such issue has arisen with a constituent of the Senator. His name is Jack Skammels, and he is concerned about the later opening date for commercial fishing of Striped Bass as opposed to the Rhode Island opening. I would love to have a conversation with you to get your insight into this issue. Is there a good time to call you? If so is there a prefered number to call?

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Article

Lost in translation: understanding divergent perspectives on a depleted fish stock

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Abstract

Fishers commonly disagree with stock assessment results, particularly when a stock declines and strict harvest controls become necessary. Such regulations alter fisher perceptions of stock dynamics, contributing to a divergence in perspectives. Some assessments have inconsistent terminal year values (retrospective patterns) which fuel distrust in scientific advice. When assessment and fishery perspectives disagree, independent surveys can help identify biases and interpret discrepancies. We examine fishery trends and assessment results for Atlantic cod in the Gulf of Maine, a stock which has declined for decades. Trends were compared to a scientific industry cooperative trawl survey and a telephone survey of fisher perceptions. Trawl survey results generally corroborate the assessment perspective on population scale and decline, yet suggest a different view of the age structure. Fisher perceptions were at odds with the assessment and trawl survey and likely resulted from regulations that altered fisher behavior, causing catch rates to increase while the stock declined. Divergent perspectives may be an unavoidable consequence of fishery management, yet acknowledging the underlying mechanisms might help avoid future conflict.

Key words: Gulf of Maine, Atlantic cod, targeting, fishing regulations, trip limits, social capital

Introduction

Wild fish populations are constantly subject to change, whether it is environmentally driven, arising from endogenous factors, or caused by variation in human harvest (Hjort 1914; Sissenwine 1984). While both harvesters and fisheries scientists acknowledge that fish stocks undergo large fluctuations over time, they frequently disagree about the current stock status (i.e., depleted or not) and trajectory (i.e., increasing or decreasing) (Verweij et al. 2010; de Nooy 2013). A primary goal of fishery management is to respond to these population changes, regulating harvest to avoid jeopardizing the long-term sustainability of the resource. To achieve this end, the fishery management system must be able to observe change over time, accurately measure it, and respond appropriately. This is fundamentally the purpose of an analytical stock assessment—to act as a model of the population's dynamics that can be used to inform harvest regulations. Although a significant challenge in its own right, completing a stock assessment is only one piece of the fishery management system. A considerable amount of work begins *after* the population status has been determined by the stock assessment. In many parts of the world (including the United States), a co-management group comprised of scientists, politicians, and stakeholders develops a fishery management plan to achieve these goals (Sen and Nielsen 1996). Plan development unfolds through a process of committee meetings, technical review, and public input to determine the potential consequences of various alternatives for fish and fishers alike. Ultimately, the members of the management group (i.e., "managers") vote to select new regulations that seek to balance harvest levels in the short term with the longer-term sustainability of the resource. As new regulations are enacted, the impact of the fishery is altered, creating change in the fish population—and the cycle repeats itself.

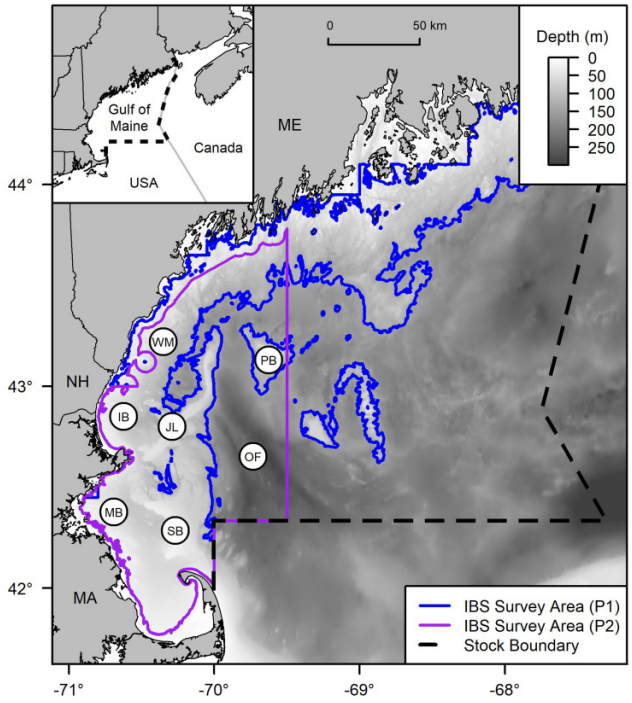
This rough sketch of the fishery management system depicts the complex, sequential, and circular nature of the interaction between assessment, management, and fishery. Although there are many places where the system can go awry, emphasis is often placed on improving stock assessment accuracy (Fulton et al. 2011); and for good reason, because if the assessment cannot accurately measure change, then the resulting regulations will lead to stock depletion, unnecessary socioeconomic harm to the fishery, or both (Yin and Sampson 2004). Even with an accurate assessment, undesirable outcomes can occur from inappropriate management choices (Cardinale and Svedäng 2008; O'Leary et al. 2011). An under-appreciated yet critical element of the management system is *social capital*, which arises from shared trust between participating groups and institutions (Pretty 2003). It is

easy to take for granted the ability of managers (comprised of representatives from both scientific and fishing communities) to reach consensus on regulatory actions, which relies on a shared understanding of stock status (Adams et al. 2003). If harvesters distrust the outcome of a stock assessment, then it becomes difficult to develop and implement a management plan (Rosenberg 2003). Lack of trust also undermines compliance and enforcement of the regulations designed to meet conservation goals (Hønneland 2000). Unfortunately, disagreements about stock status are most prevalent when the need for trust is greatest—when a stock is in decline and harvest restrictions become increasingly necessary (Glenn et al. 2012).

The uncertainty associated with stock assessments further complicates the issue of trust and social capital. Typically, estimates of population size and fishing mortality rate are most uncertain for the terminal year (i.e., last year of available data), because confidence is gained through observing cohorts of fish across their entire life span. It is not uncommon for these terminal estimates to be revised in future assessment updates, as additional data become available (Mohn 1999; Hurtado-Ferro et al. 2014). For some stocks, these revisions continually occur in the same direction, known as a *retrospective pattern*. This scenario is particularly problematic because terminal values represent the current stock status and are the basis for setting fishery catch limits (Deroba 2014). If current stock size is persistently overestimated (and fishing mortality underestimated), then the resulting regulations may be insufficient to prevent stock depletion (i.e., "overfishing" will occur), despite the fishery operating within the limits established by the stock assessment (Wiedenmann and Jensen 2018). Such outcomes breed distrust among the fishery, assessment scientists, and managers—eroding social capital (Brooks and Legault 2016).

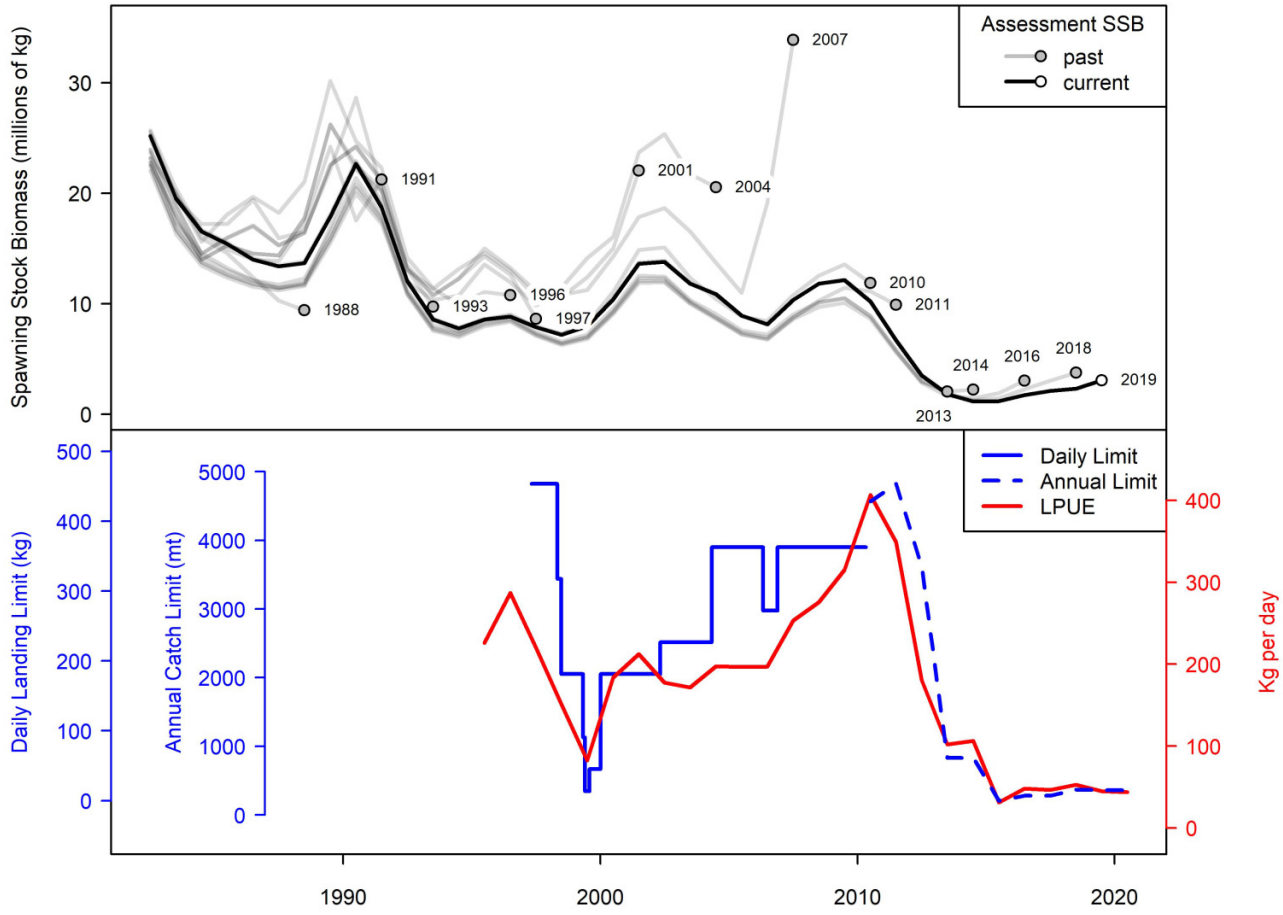
Harvesters have their own (mental) models of the fish population, built from daily observation of catch rates across season, space, and time (e.g., Nenadovic et al. 2012; Decelles et al. 2017). Yet, the non-random way in which fishing effort is applied results in a perspective that does not necessarily track the fish population (Erisman et al. 2011; Carr and Heyman 2012). Previous studies have shown how the aggregating behavior of both fish and fishers can cause indices of fishery catch-per-unit-effort (CPUE) to become *hyperstable*—i.e., increasing or remaining high as the overall population declines (Rose and Kulka 1999; Harley et al. 2001; Richardson et al. 2014). However, fishery catch rates are also influenced by regulations that both directly and indirectly determine where and when harvest occurs as well as which size fish are retained or discarded. For a fish stock that has declined over many years, the multi-layered accumulation of regulations may have a greater influence on the pattern in fishing effort than the distribution of fish (Dean et al. 2021*a*). The consequent decoupling of fishery catch rates from population trend widens the divergence in perspectives between the fishing and scientific communities. Persistent disagreement over stock status creates a perverse culture of antagonism wherein each group opposes the other, despite having the same long-term goal: high resource productivity that can sustain continued harvest (Rosenberg 2003; Verweij et al. 2010).

Fig. 1. Map of the stock boundaries for Atlantic cod in the Gulf of Maine (dashed black line). The study area boundaries for the industry-based trawl survey (IBS) are shown in blue (P1: 2004–2006) and purple (P2: 2016:2018). Locations indicated: WM = western Maine; PB = Platts Bank; IB = Ipswich Bay; JL = Jeffries Ledge; MB = Massachusetts Bay; SB = Stellwagen Bank; OF = Offshore. Bathymetric data were obtained from the Coastal Relief Model produced by NOAA's National Center for Environmental Information. The map is in unprojected geographic coordinates.



The fishery for Atlantic cod in the Gulf of Maine (Fig. 1) has experienced many of the unfortunate conditions described above. The assessment perspective depicts a stock that has declined for several decades and is currently at 5% of its target population size (NEFSC 2021). However, a major retrospective pattern, wherein spawning stock biomass (SSB) is routinely over-estimated (Fig. 2) and fishing mortality (F) underestimated, has caused significant uncertainty in model results (Wiedenmann and Jensen 2018). Fishery managers have attempted to constrain F using various regulations, including area closures (1998–present), effort restrictions and trip limits (1997–2009), and annual quotas (2010–present). Unfortunately, these management actions have failed to prevent overfishing every year since 1981, even though the fishery routinely harvests within the limits set by stock assessments (Wiedenmann and Jensen 2018). The US government has declared the fishery a "federal resource disaster" on three separate occasions (1994, 1995, 2012), and the stock has entered a mandated 10-year rebuilding plan on two occasions (2004, failed; 2014, ongoing); Recent evidence suggests there is little hope of success before the end

Fig. 2. [Top] Spawning stock biomass (SSB) estimates from past and current stock assessments with the terminal year for each assessment labeled. Results for assessments that assumed a phased increase in natural mortality (i.e., Model 2) are omitted because that model was not created until 2012. [Bottom] Daily and annual harvest limits for Atlantic cod (blue), and mean landings-per-unit-effort or LPUE (red), as reported on fisherman logbooks.



of the current rebuilding plan in 2024 (NEFSC 2021). Increasingly restrictive regulations and stock rebuilding failures have caused severe social, emotional, and economic harm among the fishing community (Scyphers et al. 2019). Fisher distrust in science-based fishery management is high, and industry groups routinely oppose any new conservation measures (Dobbs 2000; Hartley and Robertson 2006). In response, environmental advocacy groups frequently sue the federal government to sway managers in a more precautionary direction (Rosenberg 2003; Acheson and Gardner 2011). The influence of constantly shifting regulations on catch rates has led to fishery-dependent indices being removed from the stock assessment (NEFSC 2012), diminishing fishery confidence that they have a voice in the management process. Significant misreporting of catch has eroded trust in the primary assessment data sources (Palmer 2017). In short, both the biological and social capital of this system are severely depleted.

When both the assessment and fishery perspectives appear unreliable, how can managers avoid making decisions that might worsen the situation for both fish and fishers? One approach is to seek answers as to why the groups disagree (Daw et al. 2015; Horowitz et al. 2018). Investigating the origins of each perspective acknowledges the validity that lies at their core and can help identify biases and inappropriate regulations (Adams et al. 2003). However, reaching a collective agreement is difficult because it requires information that is credible to both the fishing and scientific communities. To this end, the Massachusetts Division of Marine Fisheries (MADMF), with funding from the US Department of Commerce (Federal Disaster Relief Funds), developed an industry-scientific cooperative bottom trawl survey in 2003. This initial 3-year survey (2004–2006) contracted commercial fishing vessels to conduct standardized tows according to a scientific design using identical equipment. Through broad seasonal and spatial coverage, this survey intensively sampled the cod population in the Gulf of Maine to provide a comprehensive description of its spatio-temporal distribution and demographics. Importantly, members of both the fishing and scientific communities were involved at each step of the project, from design through execution. After the first Gulf of Maine cod rebuilding plan failure in 2014, this survey

concept was revived for another 3 years (2016–2018) of intensive sampling. Together, these two survey periods provide a unique opportunity to independently evaluate the size and trajectory of the Gulf of Maine cod stock over a decadal time scale.

Here, we utilize the MADMF industry-based cooperative trawl survey data set, in addition to a telephone survey of fishing captains, to evaluate the assessment of and fishery perspectives on Atlantic cod in the Gulf of Maine. By examining the relationships between population size, regulations, catch rates, and fishery perceptions, we aim to understand the origins of divergence between these perspectives—i.e., how can opposing views simultaneously occur for the same fish stock?

Methods

The general approach involved first describing scientific and fisher perspectives on the Gulf of Maine cod stock by examining stock assessment results and by directly interviewing members of the fishing community, respectively. To help validate these perspectives, we independently estimated population size and trajectory using a data set from a trawl survey specifically designed to comprehensively sample this stock. Lastly, we explored the record of fishing regulations and fisher logbook data to help explain the possible origins of the fisher perspective.

Scientific perspective

The trajectory of estimated population size of the Gulf of Maine cod stock was extracted from stock assessment reports published by the Northeast Fisheries Science Center (NEFSC). The stock has been assessed using quantitative population models at irregular intervals since 1986, with each iteration providing estimates of SSB and total abundance (N) from 1981 through the last year of available data (i.e., "terminal year"). The assessment model was initially a virtual population analysis (NEFSC 1989), but switched to a statistical catch-at-age model in 2012 (terminal year 2010, NEFSC 2012). In part to counteract a strong retrospective pattern, a model variant was developed in 2013 (terminal year 2011, NEFSC 2013) that assumed an increase in natural mortality (M) in the recent period. Since that time, both models (Model 1: assuming constant $M = 0.2$; Model 2: assuming an increase in M from 0.2 to 0.4 between 1989 and 2003) have been used to inform fishery management. Both models treat all fishery removals as a single aggregate fleet with selectivity represented by an increasing logistic curve (i.e., "flat topped") and are informed by three fishery-independent trawl surveys treated as age-structured indices of abundance (two with flat-topped selectivity and one with selectivity estimated independently by age). These assessment models provide estimates of total abundance (N) on January 1, and SSB is estimated by multiplying these N-at-age values by the time series average maturity-at-age of female cod from the NEFSC Spring survey and the annual average weights-at-age from the fishery, adjusted to the assumed start of spawning (April 1).

The scientific perspective was evaluated by independently estimating population size using the area-swept method of extrapolating trawl survey observations of fish density to the entire stock area (Alverson and Pereyra 1969). The primary source of these data was a trawl survey conducted by the MADMF during two separate time periods (P1: November 2003–May 2007; P2: April 2016–January 2019), in cooperation with the commercial fishing industry. Known as the industry-based survey or IBS because it used a commercial-style net and was operated from a chartered commercial fishing vessel, this program executed a stratified random fishery-independent sampling design that facilitated generalizing results to estimates of the population. Although there were differences in the spatial and seasonal allocation of survey effort between periods (Fig. 1; P1: 5 cruises/year, November—May; P2: 8 cruises/year, April–July, October–January), identical survey equipment and towing protocols were used throughout (see Dean et al. 2019, 2021*a* for additional details on survey design and methodology).

A set of trawl efficiency experiments were conducted between 2016 and 2019 to estimate the length-dependent escapement of cod beneath the footrope as well as the depth-dependent herding effect of the trawl doors and sweeps (Dean et al. 2021*b*). These efficiency estimates for the IBS survey trawl were used to translate the observed catches per tow to cod density-at-length (D_l; fish/km^2). To maintain consistency with the stock assessment, D_l was translated to density-at-age (D_a) via an age-length-key constructed using the continuation ratio logits (CRL) modeling approach of Berg and Kristensen (2012) (Appendix A). This age-length-key model was necessary to account for the seasonal growth that occurs within the 10-month observation window of the IBS survey data set as well as the spatial patterns in length-at-age due to sub-population structure (Dean et al. 2019).

The mean density-at-age ($\bar{D}_a$) was then calculated within each stratum (m) and cruise (c; one complete tour of all survey strata), multiplied against the spatial extent of each stratum (A_m in km^2), and then summed across strata. The resulting values represent the estimated population size (N^*) within the IBS survey area for each cruise:

$$(1) \qquad N^*_{a,c} = \sum_m \bar{D}_{a,c,m} A_m$$

A separate trawl survey, conducted by the NEFSC, was used to account for the remainder of the stock area (Fig. 1) not sampled by the IBS survey. The NEFSC survey sampled from nearly the entire stock area, albeit at a much lower rate (82% fewer tows/km^2/year than the IBS survey). Using the same age-length-key model (Appendix A), mean cod D_a per tow was calculated for "Spring" (April–June) and "Fall" (October–November) NEFSC survey cruises based on the recorded tow length and the expected net width at the sampled depth. The NEFSC survey strata were aggregated to broad areas that received similar levels of survey effort (e.g., strata beginning with 13XX were lumped together), cropped to the stock area, and then intersected with the IBS study area for each IBS cruise. The mean NEFSC D_a was then calculated within these polygons and multiplied by the spatial extent

of each polygon to achieve area-specific estimates of total abundance. The fraction of the population observed by the NEFSC that was contained within the IBS survey area (θ) was then calculated from these area-specific estimates. NEFSC Fall survey cruises were used to estimate θ for IBS cruises that occurred between October and January, whereas NEFSC Spring cruises were used for IBS cruises that occurred between April and July. The relatively small number of NEFSC tows with cod and the variability in cod catches resulted in substantial (but unlikely) interannual variation in θ. As such, calculations were conducted using a 3-year moving window (e.g., NEFSC Spring survey tows from 2004 to 2006 were used to calculate θ for the IBS April–May cruise in 2005) to minimize the influence of random sample variation. The population size observed by the IBS but not the NEFSC (φ) was calculated using eq. 1, but expanding the density of cod within each IBS stratum to only the area outside of the NEFSC study area.

These age- (a) and cruise- (c) specific φ and θ values were then used to estimate the population size of the full stock area:

$$N_{a,c} = \varphi_{a,c} + \frac{N^*_{a,c} - \varphi_{a,c}}{\theta_{a,c}} \quad (2)$$

Areas shoreward of the IBS survey area were ignored in these calculations because they were considered to contain only a small fraction of the total age 1+ cod. The Period 1 IBS survey cruises that occurred during February–March were omitted from this analysis because they were considered to be an inappropriate seasonal match for either the Spring or Fall NEFSC surveys. Total estimated abundance (N) was also translated to units of SSB by multiplying fish abundance-at-age by the estimates of weight-at-age and maturity-at-age used in the stock assessments.

To achieve broad seasonal coverage, the IBS survey distributed sampling effort across multiple cruises per year. Consequently, each cruise-specific estimate had relatively high measurement error due to random sample variation. To more effectively use these data to evaluate assessment scale and trajectory, we averaged cruise-specific estimates within each IBS survey period and compared these values to equivalent assessment values averaged within the same periods. Period-specific IBS estimates of population size were compared to the most contemporaneous stock assessment (terminal year 2018, NEFSC 2019) to evaluate the scientific perspective used for fishery management, as well as the most recent stock assessment (terminal year 2019, NEFC 2021) to evaluate retrospective bias. Specifically, the mean N and SSB of IBS survey cruises that occurred between January 2004 and January 2007 were compared to the assessment mean N and SSB during 2004–2007. Likewise, the mean of IBS survey cruises between April 2016 and January 2018 was compared to the mean of assessment years 2016–2018.

Uncertainty in survey-based estimates was characterized by bootstrap re-sampling each of the component data sets, by strata, 1000 times and re-calculating mean stock size by period. The 2.5th and 97.5th percentiles from the distribution of outcomes were used to represent the confidence intervals for survey-based estimates. Uncertainty in the average N and SSB from the assessment was characterized by calculating period-specific standard errors from the annual standard errors (σ) reported by the assessment model software (ASAP):

$$SE_p = \left(\frac{\sum_y \sigma_y^2}{n_p^2} \right)^{1/2} \quad (3)$$

Fisher perspective

Trends in commercial fishing effort and catch were derived from vessel logbooks (i.e., vessel trip reports), which have been required for every trip conducted by vessels with a federal commercial groundfish permit since 1996 (Amendment 5 to the Fishery Management Plan - 59 FR 9872). Fishing effort was measured as the total number of days fished for any trip that landed at least one of the 13 "regulated groundfish" species within the Gulf of Maine Cod stock area (Fig. 1). Catch rates were calculated as the mean reported pounds of cod landed per day fished (landings-per-unit-effort or LPUE). We chose to focus on LPUE instead of CPUE (which includes discarded fish) for two reasons: First, we assume that fishery perceptions about the stock were most directly related to the *landed* catch that gets reported and generates revenue for captain and crew. Second, it is difficult to obtain an accurate estimate of discards without full at-sea monitoring by scientific fishery observers (i.e., 100% observer coverage) (Branch et al. 2006). Given the relatively low observer coverage in this fishery (typically <25%) and that having an observer on board can cause captains to alter fishing behavior (Benoit and Allard 2009), we have greater confidence in the LPUE metric.

The extent of fishery targeting (or avoidance) of Atlantic cod was described through several metrics. First, the primary target for each reported trip was identified as the species that generated the greatest landings value on that trip (Gillis et al. 2008). Value was estimated by multiplying the reported quantity landed by the average landing price for that species in Gulf of Maine ports in that month and year, as reported by commercial seafood dealers. The fraction of total trips associated with each target species was then calculated by year. However, because it is possible that a species dominated the catch simply because of increased availability (i.e., through population increase or changes to spatial management), targeting was also evaluated by examining the spatial dynamics of fishing effort. Specifically, the spatial footprint of the fishery was estimated by fitting a two-dimensional kernel density utilization distribution (Seaman et al. 1999) to the reported groundfish trip locations in a given year and month and then calculating the area inside the 95th percentile contour (UD_{95}). The mean UD_{95} across all months, weighted by the total number of trips in each month, was used to represent the fishery footprint in each year. Trip locations were represented by the center of the reported 10-min "square" of latitude and longitude, generally assumed to be the finest spatial resolution deemed appropriate for these data (Lucey and Fogarty 2013). In addition, the average distance between reported trip locations and the peak cod fishing area (i.e., the 10-min square with the highest reported cod landings for that given year

and month) was calculated. Pearson correlation coefficients were used to compare fishery catch rates (LPUE), SSB from the most recent assessment, targeting metrics (% of trips; fishery footprint; distance from peak cod area), and the sequence of regulations that limited harvest by day (daily landing limits or DLL, 1997–2009) or year (annual catch limit or ACL, 2010–present).

Perceived change in population size was described via a 2018 telephone survey of commercial fishing captains, as part of a longitudinal study of stress in fishing communities of the Northeast United States (see Scyphers et al. 2019 for detailed methodology for this survey). Survey participants were restricted to current and past owners of federal northeast multispecies (i.e., "groundfish") permits. Each interviewee was asked a series of questions about psychological distress, social disruption, social resilience, and recreancy or trust in various institutions (38 different government, industry, environmental, and academic organizations). To characterize perceived trends in the fish population, each participant was also asked: "*over the past 10 years, would you say the Gulf of Maine cod stock, (a) increased a lot; (b) increased a little; (c) remained the same; (d) decreased a little; (e) decreased a lot)?*". We focused on decadal-scale change for several reasons: (1) 10 years is the default stock rebuilding period for US-managed fisheries, (2) it encompasses mean generation time for Atlantic cod in the Gulf of Maine, (3) the assessment retrospective pattern has typically not impacted estimates a decade out from the terminal year, and (4) it matched the timeframe between IBS survey periods. Associations between perceived population trends and other ordinal response variables (e.g., stress, trust in institutions) were evaluated using the Spearman rank correlation coefficient. Specifically, correlations with $p < 0.05$ were considered to be significant.

To investigate an underlying association between catch rates and fisher perceptions of population trend, the trailing % change in LPUE over the prior decade was calculated for each year of available data (i.e., $\left(\frac{\text{LPUE}_y}{\text{LPUE}_{y-10}} - 1\right) \times 100$). However, given that perceived decadal change likely involves a mental model that integrates observations over several years (Friedman 1993), fishery catch rates were subject to a 3-year moving average prior to the calculation of decadal % change. The aim here was to construct a time series of trends in catch rate that would have informed fishermen's perceptions, as if we had conducted the phone survey every year. A trailing decadal % change was also calculated for the stock assessment estimates of SSB, allowing for an effective comparison between fishery and assessment perspectives.

Results

A total of 2548 tows (P1 = 1598 tows in 12 cruises; P2 = 986 tows in 24 cruises) from the IBS trawl survey were used to estimate population size within the limits of its study area during the two periods. An additional 1039 tows from the NEFSC trawl survey (534 tows inside IBS area; 505 tows outside IBS area) were used to expand these estimates to the full stock area. The majority of the cod population was encompassed by the IBS study area during both periods—however, some age groups in some years were more abundant outside the IBS study area (Table 1). Across all cruises, an average of 0.3% of the population was estimated to occur in areas covered by the IBS but not the NEFSC surveys. More than 90% of fishing effort and cod landings came from within the IBS study area during both survey periods.

The cruise-specific estimates of population size from the IBS survey were highly variable (Table 2) due to the relatively low sample size for each cruise, but generally matched the aggregate trend of the stock assessment, particularly during the earlier period (Fig. 3). When averaged within period, both assessment models estimated total aggregate abundance (N) in the recent period (P2) similar to that of the IBS survey estimate (Fig. 3; Tables 2 and 3) despite having a different population age structure (Figs. 4 and 5). However, during the earlier period (P1), Model 1 underestimated abundance and Model 2 overestimated abundance, with respect to the IBS survey. There were no significant differences between either assessment model and the survey in terms of the extent of decline in abundance (Table 4). Both assessment models estimated fewer age-5+ cod than the IBS survey during Period 1, resulting in assessment estimates of SSB that were significantly less than the IBS survey (by 37%–55%). While the relative abundance of younger cod (ages 1 and 2) was dramatically different between assessment and IBS survey during Period 2 (Fig. 5), the estimates of aggregate SSB were similar. However, this similarity in recent SSB diminished with the subsequent assessment update (terminal year 2019), which found Period 2 SSB to be significantly less than the IBS survey (by 35%–50%). The extent of decline in SSB between periods for assessment model 1 was significantly less than that of the IBS survey. For both abundance and SSB, the population trend in the assessment models became more similar to the IBS survey with the subsequent assessment update (terminal year 2019). Despite these differences between assessment and IBS survey estimates of population size, both approaches agree that the Gulf of Maine cod stock declined substantially between periods.

A total of 130 fishing captains were interviewed in 2018, 94 of which offered an opinion about the decadal trend in the cod population. Most participants (63%) said that the cod population had increased over the prior decade, while 24% claimed it had decreased, and 13% concluded it had remained the same (Fig. 6). The most common response (44%) was that the cod population had increased "*a lot*". Of the 38 institutions that participants were asked about, the perceived cod trend was significantly correlated only with trust in the NEFSC ($r = -0.26$; $p = 0.017$; $df = 82$) and local government ($r = -0.22$; $p = 0.033$; $df = 92$), with those that perceived cod to be increasing having less trust in these institutions. In addition, perceptions of cod population size were positively associated with greater distress (Scyphers et al. 2019) ($r = 0.25$; $p = 0.015$; $df = 94$).

Fishery catch rates (LPUE) were strongly correlated with targeting of cod (Table 5). LPUE and targeting were also strongly correlated with daily and annual harvest limits and to a lesser extent with SSB. Consequently, LPUE increased as the daily limit was raised several times between 2000 and 2006, despite the population declining over this same timeframe

Table 1. Estimated average fraction of total abundance (N) observed by the NEFSC bottom trawl survey that occurred within the IBS study area (θ), by age and year. Values for NEFSC Spring cruises were applied to IBS cruises that occurred between mid-March and July. Values for NEFSC Fall cruises were applied to IBS cruises that occurred between October and mid-February.

	Age								
Year	1	2	3	4	5	6	7	8	9+
Spring									
2004	0.78	0.95	0.83	0.87	0.77	0.75	0.80	0.83	0.88
2005	0.81	0.93	0.85	0.86	0.68	0.69	0.63	0.59	0.55
2006	0.97	0.98	0.97	0.94	0.84	0.86	0.70	0.71	0.78
2007	0.97	0.99	0.97	0.95	0.85	0.87	0.62	0.68	0.76
2016	0.40	0.40	0.38	0.71	0.88	0.94	0.95	1.00	1.00
2017	0.47	0.39	0.31	0.65	0.83	0.93	0.95	1.00	1.00
2018	0.83	0.86	0.80	0.84	0.89	0.93	0.95	1.00	1.00
Fall									
2003	0.96	0.96	0.77	0.81	0.83	0.88	0.88	0.88	0.67
2004	0.96	0.97	0.82	0.79	0.82	0.87	0.87	0.90	0.58
2005	0.95	0.94	0.84	0.77	0.88	0.89	0.84	0.74	0.40
2006	0.95	0.93	0.86	0.81	0.84	0.80	0.75	0.70	0.41
2007	0.94	0.90	0.85	0.84	0.83	0.76	0.67	0.60	0.43
2016	0.69	0.63	0.49	0.78	0.83	0.88	0.86	0.91	1.00
2017	0.65	0.44	0.37	0.68	0.75	0.77	0.71	0.81	1.00
2018	0.99	0.77	0.84	0.81	0.86	0.85	0.80	1.00	1.00
2019	0.99	0.79	0.89	0.83	0.89	0.90	0.81	1.00	1.00

(Fig. 7). A brief increase in population biomass between 2007 and 2009, combined with a high daily limit, led to steep increases in both targeting (Fig. 8) and catch rates of cod (Fig. 2). After the fishery switched from daily to annual limits in 2010, large reductions in ACL led to an abrupt decline in the targeting of cod (from 74% of trips in 2010 to 5% of trips in 2015) as well as the LPUE. As captains were forced to alter their targeting behavior to avoid cod, fishing effort patterns became less concentrated and less cod-focused, as evidenced by a 350% increase in fishery footprint and a 240% increase in the average distance from peak cod fishing areas (Fig. 8).

Although the spawning stock declined by 85% over the assessment time series, some relatively brief periods of increase did occur (e.g., 1988–1990; 1999–2002; 2007–2009; Fig. 2). As a result, there were some years where the trailing decadal trend of the assessment was positive before turning strongly negative after 2009 (Fig. 9). In contrast, the trailing decadal trend in fishery catch rates was overwhelmingly positive for several additional years. Fishery catch rates experienced an average trailing decadal trend of + 45% between 2006 and 2016, compared to an average trend of −26% (Model 1) to −30% (Model 2) for the stock assessment over the same range of years. However, this general trend in fishery catch rates varied by gear, season, and area due to spatio-temporal patterns in both fish and fishing effort (Fig. 9). Trawl vessels experienced the largest and longest difference in trend from the assessment. Vessels fishing in Massachusetts Bay, Ipswich Bay, and Stellwagen bank experienced increasing trends for a longer period of time than those fishing in other areas.

Discussion

A central theme from this investigation is the many (often unintended) ways in which fishery regulations have impacted not only the dynamics of fish and fishers but also the ability to perceive these changes. Human harvest accounts for an outsized share of the annual mortality in this stock (average $F/Z = 0.8$ for the assessment time series, assuming $M = 0.2$), which means that even small modifications to the way in which we exert this influence can have a large impact on the cod population. Some regulatory mechanisms are obvious—shifts in minimum mesh and fish sizes have a clear and direct influence on the size selectivity of a fishery (Millar and Fryer 1999); Others are more subtle, such as changes to time/area closures differentially impacting sub-populations of cod (Dean et al. 2019) and indirectly altering fishery selectivity (Dean et al. 2021*a*). In the current paper, we focus on the association between harvest limits (DLL and ACL) and fishery catch rates and their combined influence on perceptions of stock status. The primary purpose of each of these regulations is to limit the impact of the fishery on the sustainability of the fish population, with the longer-term goal of increased recruitment and stock rebuilding. Yet, in some cases, the unintended consequences of a regulation may outweigh the intended benefit.

Between 1994 and 2010, the primary tool for fishery managers to constrain fishing mortality was to limit the annual days-at-sea (DAS) allocated to each vessel (Wang and Rosenberg 1997). As the stock declined and DAS allocations were reduced, the DLL for cod was *increased* on several occasions (see Table 1 in Richardson et al. 2014 for a detailed

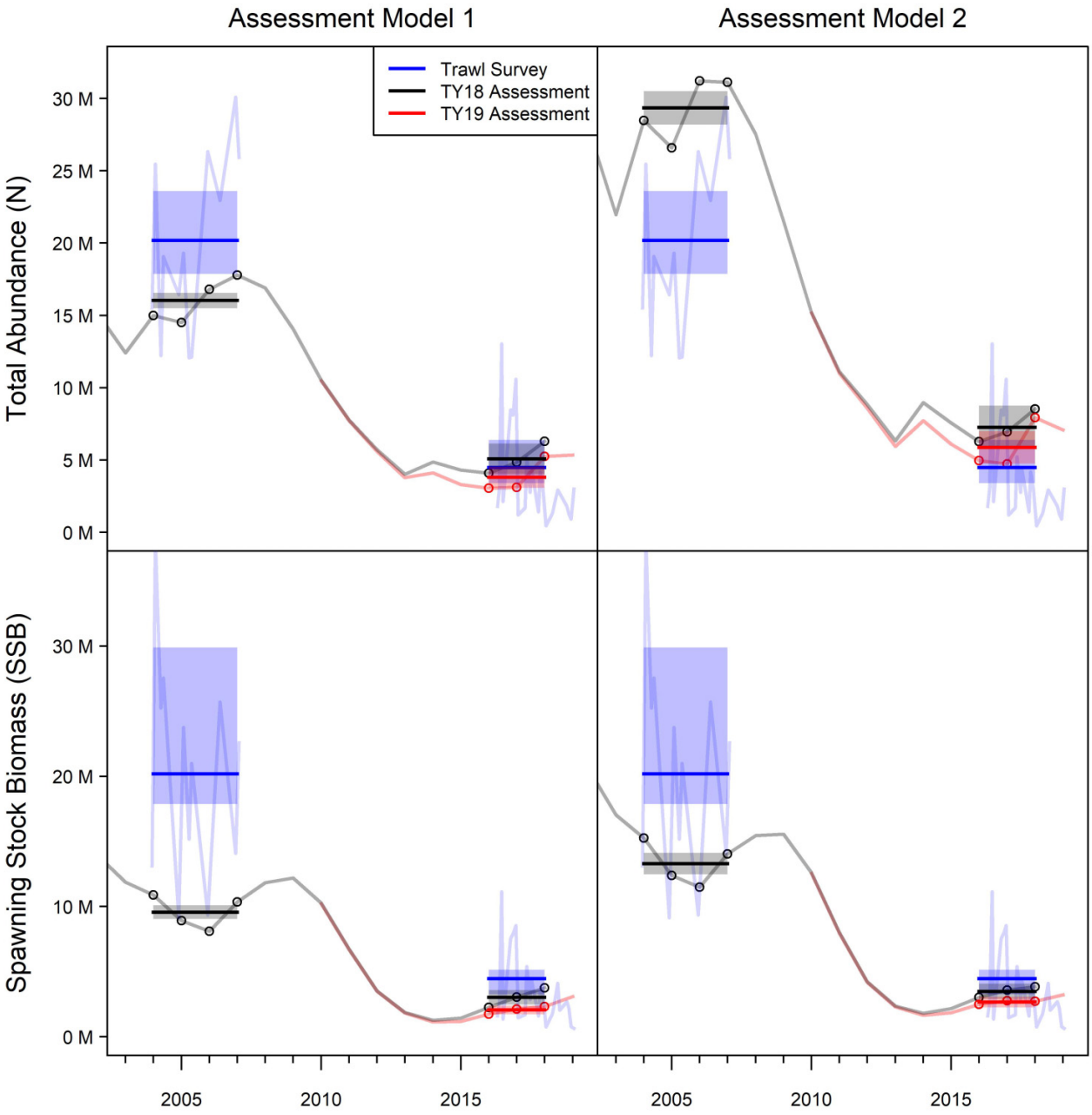
Table 2. IBS trawl survey estimates of total stock abundance (*N*, in millions of fish) and spawning stock biomass (SSB, in thousands of metric tons) by survey cruise (i.e., one complete sampling of the study area). Rows shown in bold were used to estimate mean *N* and SSB by survey period for comparison to stock assessment values. Confidence intervals (CI, at 95%) were determined by bootstrap re-sampling of the component data sets.

Period 1				Period 2			
Year	Cruise	*N*	SSB	Year	Cruise	*N*	SSB
2003	Nov—Dec	15.5	13.1	**2016**	**Apr**	**1.8**	**1.6**
2004	**Jan—Feb**	**25.5**	**38.1**	**2016**	**May**	**3.1**	**2.6**
2004	**Mar—Apr**	**12.2**	**25.2**	**2016**	**Jun**	**13.0**	**11.1**
2004	**Apr—May**	**19.1**	**27.6**	**2016**	**Jul**	**2.1**	**1.3**
2004	**Nov—Dec**	**16.4**	**9.1**	**2016**	**Oct**	**8.5**	**7.5**
2005	**Jan—Feb**	**19.3**	**23.8**	**2016**	**Nov**	**8.1**	**7.9**
2005	**Mar—Apr**	**12.1**	**15.2**	**2016**	**Dec**	**10.6**	**8.6**
2005	**Apr—May**	**12.1**	**21.0**	**2017**	**Jan**	**1.2**	**1.5**
2005	**Nov—Dec**	**26.3**	**9.3**	**2017**	**Apr**	**1.7**	**1.7**
2006	**Apr—May**	**22.9**	**25.7**	**2017**	**May**	**5.2**	**5.4**
2006	**Nov—Dec**	**30.1**	**14.1**	**2017**	**Jun**	**2.8**	**2.9**
2007	**Jan—Feb**	**25.9**	**22.6**	**2017**	**Jul**	**4.4**	**4.4**
	P1 mean	20.2	21.1	**2017**	**Oct**	**1.4**	**1.6**
	CI low	17.9	17.9	**2017**	**Nov**	**4.2**	**3.5**
	CI high	23.6	29.9	**2017**	**Dec**	**3.0**	**3.2**
				2018	**Jan**	**0.4**	**0.8**
				2018	Apr	1.3	1.8
				2018	May	2.0	2.7
				2018	Jun	2.9	4.1
				2018	Jul	2.7	2.0
				2018	Oct	1.8	2.7
				2018	Nov	1.3	2.2
				2018	Dec	0.9	0.8
				2019	Jan	3.0	0.6
				P2 mean		4.5	4.1
				CI low		3.4	3.3
				CI high		6.4	5.2

summary of regulation changes) in an attempt to minimize regulatory discards (i.e., mandatory discarding of fish over the daily limit). A decade of daily limit increases incentivized targeting of cod, due to the proximity of remaining areas of abundance and high market price relative to other species. The management decision to increase daily limits while the stock declined altered fishery behavior, causing the trajectory of catch rates to diverge from that of the population. When fishery management transitioned in 2010 to a system of ACLs allocated to self-organized fishing collectives known as "sectors" (Amendment 16, 75 FR 18262), effort restrictions and daily limits were lifted for nearly all vessels. As the ACL declined with each assessment update, the fishery was incentivized to avoid cod and catch rates finally declined. Our finding of a regulation-induced change in targeting behavior is further supported by Huang et al. (2018), who found that the shift in management regimes resulted in a diversification of areas fished and species caught. This association between harvest limits, targeting, and LPUE overshadowed the underlying connection between population size and fishery catch rates. For this reason, regulation changes should be carefully accounted for when attempting to construct an index of abundance from fishery catch rates.

Proposed regulation changes are often analyzed as part of the plan development process, offering managers a range of projected outcomes to inform their selection of a preferred option from the array of alternatives. These analyses typically rely on an examination of prior fishery-dependent data, or a simulation structured around such data (e.g., Amendment 13–69 FR 22906), wherein it is common to assume little change in fisher behavior in projections (Fulton et al. 2011). Yet, in many cases, it becomes clear in hindsight that fisher behavior was altered by the shifting regulatory landscape, leading to unanticipated outcomes (e.g., Abbott and Haynie 2012; Saul and Die 2016; Pulver et al. 2019). As pointed out by Hilborn (2007), fishery management is far more about managing people than about managing fish and careful attention

Fig. 3. IBS trawl survey estimates of total stock abundance (*N*) and spawning stock biomass (SSB) compared to assessment estimates from two models (Model 1 = constant natural mortality; Model 2 = increasing natural mortality) at two different times (TY18 = terminal year 2018; TY19 = terminal year 2019). Thin blue lines indicate trawl survey estimates by cruise (i.e., one complete sampling of the study area). Thick horizontal lines represent average values during each period (P1 = January 2004–January 2007; P2 = January 2016–January 2018), with the shaded regions representing the 95% confidence interval. Circles represent the annual assessment values used to calculate period-specific averages.



needs to be paid to shifts in incentives brought about by regulatory change (Fulton et al. 2011). Although the switch to ACL has now better aligned fishery incentives with conservation goals for Gulf of Maine cod, the negative consequences of past management choices are still impacting fisher perspectives.

Fishers acquire extensive ecological knowledge through daily direct observation of catch rates, and they are often acutely aware of spawning grounds (Decelles et al. 2017), trophic interactions (Bevilacqua et al. 2016), and shifting spatio-temporal distributions (Azzurro et al. 2019). Recognizing these patterns is essential to the success of a fishing captain, and the tactical decision of where to deploy their gear integrates this ecological knowledge within the complex array of regulations. Fisher ecological knowledge (FEK) also accumulates over generations (Drew 2005), and New England fishing ports (on either side of *Cape Cod*) developed around

Table 3. Stock assessment estimates of total stock abundance (*N*, in millions of fish) and spawning stock biomass (SSB, in thousands of metric tons) for two models (Model 1 = constant natural mortality; Model 2 = increasing natural mortality) at two different times (TY18 = terminal year 2018; TY19 = terminal year 2019). Confidence intervals (CI, at 95%) for period mean values were calculated from annual standard errors via eq. 2.

	N				SSB			
	Model 1		Model 2		Model 1		Model 2	
Year	TY18	TY19	TY18	TY19	TY18	TY19	TY18	TY19
				Period 1				
2004	15.0	15.0	28.5	28.6	10.9	10.9	15.3	15.3
2005	14.5	14.5	26.6	26.6	8.9	8.9	12.4	12.5
2006	16.8	16.8	31.2	31.2	8.1	8.1	11.5	11.5
2007	17.8	17.8	31.1	31.1	10.4	10.4	14.0	14.1
P1 mean	16.0	16.0	29.4	29.4	9.6	9.6	13.3	13.4
CI low	15.5	15.5	28.2	28.2	9.0	9.0	12.5	12.5
CI high	16.6	16.6	30.5	30.5	10.1	10.1	14.1	14.2
				Period 2				
2016	4.1	3.0	6.3	5.0	2.3	1.7	3.0	2.5
2017	4.8	3.1	6.9	4.7	3.1	2.1	3.6	2.8
2018	6.3	5.2	8.5	7.9	3.8	2.3	3.8	2.7
P2 mean	5.1	3.8	7.2	5.9	3.1	2.0	3.5	2.7
CI low	4.0	3.0	5.7	4.7	2.5	1.7	2.9	2.3
CI high	6.1	4.5	8.7	7.0	3.7	2.4	4.0	3.0

centuries of harvesting Atlantic cod (Jensen 1972; Kurlansky 1997). Knowledge of productive cod fishing grounds is part of the heritage of this fishing community. FEK is also what enables captains to target a species and fill their harvest limit (either daily or annual) even as the stock declines (Branch and Hilborn 2008)—which is clearly the case for Gulf of Maine cod. As such, the magnitude of these limits directly influences targeting and thus the catch rate experienced by the fishery.

Despite the overarching influence of regulations, it would be a mistake to assume that all fishers experienced a similar trend in catch rates. The Gulf of Maine cod fishery is part of a broader multi-species, multi-fleet fishery that spans several state and international jurisdictions wherein gear type, homeport, and vessel size all influence the spatio-temporal patterns in fishing effort (Dean et al. 2021*a*). Underlying these effort patterns is the spatio-temporal distribution of the fish population, as influenced by habitat preference (Rose and Kulka 1999), aggregation behavior (Mello and Rose 2005), a dynamic population structure (Dean et al. 2019), and environmental cues such as predators (Trzcinski et al. 2006), prey (Richardson et al. 2014), and climate forcing (Runge et al. 2010). The combination of these factors in this complex social-ecological system introduces heterogeneity in the catch rates experienced by individual fishers, which in turn alters their perception of trends in the fish population. For instance, Massachusetts trawlers witnessed a much higher increase in catch rates for a longer period of time than gillnetters from Maine. Despite this heterogeneity, the common influence of increasing trip limits (i.e., DLL) led each component of the fishery to experience an increase in catch rates as the population declined.

It is important to recognize that the decadal trend in catch rates did not match the results of the survey of fisher perceptions. By 2018, when the telephone survey was conducted, reported fishery catch rates of cod had declined dramatically from the decade prior, yet many fishing captains still responded that the cod population had "*increased a lot*" over the same time frame. To understand this discrepancy, we should acknowledge the management setting during this time. As a result of the dire outlook from the 2014 stock assessment update, an emergency management action (79 FR 67362) severely limited access to cod fishing grounds for most of a year. This was replaced by a fully developed management action in mid-2015 (Framework 53–80 FR 25110) that once again significantly altered the spatial management system, in addition to further reducing the ACL (a 95% reduction from 2010). This sequence of regulatory change represents the greatest disruption to fishing effort in the history of the fishery (Dean et al. 2021*a*). Captains had to adapt to fishing in new times/areas and transition away from targeting cod to avoiding the species. As such, it may have taken additional time for fishers to form *new* opinions on the cod population that differed from their previous experiences. Furthermore, a series of management actions between the two IBS periods closed nearly all the known cod spawning grounds to fishing, and the resulting redistribution of fishing effort shifted the size selectivity of the fishery toward smaller fish (Dean et al.

Fig. 4. IBS trawl survey estimates of total stock abundance (*N*) and spawning stock biomass (SSB) by age compared to assessment estimates from two models (Model 1 = constant natural mortality; Model 2 = increasing natural mortality) at two different times (TY18 = terminal year 2018; TY19 = terminal year 2019), averaged within two periods (P1 = January 2004–January 2007; P2 = January 2016–January 2018).

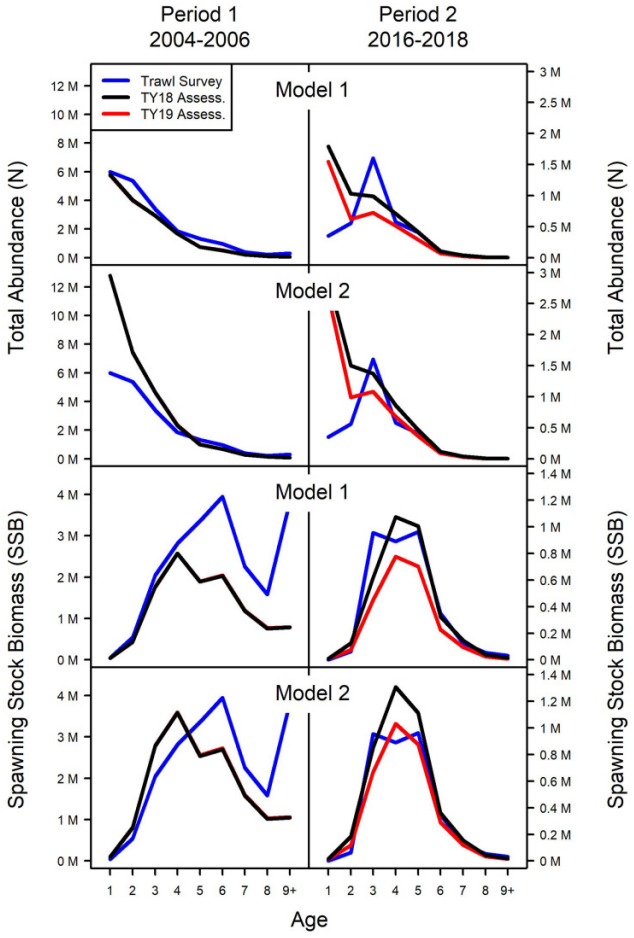
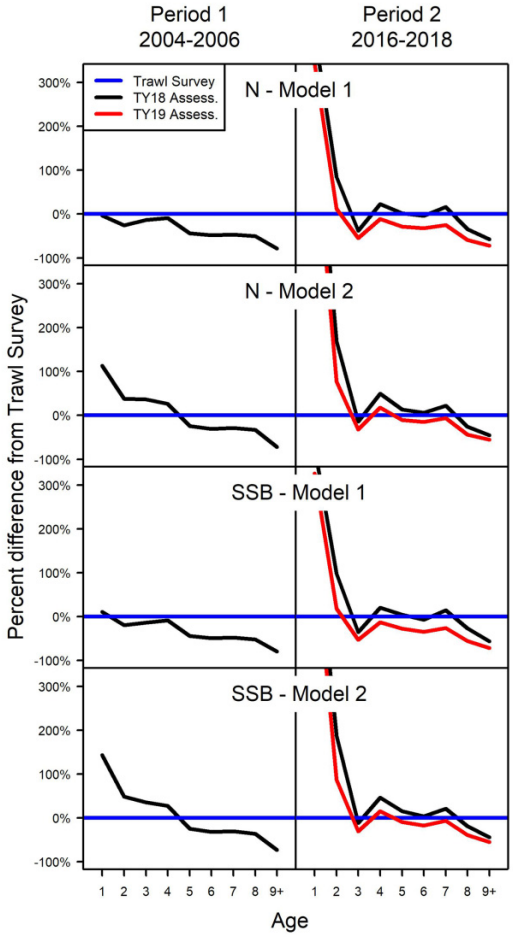


Fig. 5. Percent difference in total stock abundance (*N*) and spawning stock biomass (SSB) by age between assessment and IBS trawl survey (i.e., 100∗(assessment-survey)/survey) for two assessment models (Model 1 = constant natural mortality; Model 2 = increasing natural mortality) at two different times (TY18 = terminal year 2018; TY19 = terminal year 2019) during two periods (P1 = January 2004–January 2007; P2 = January 2016–January 2018).



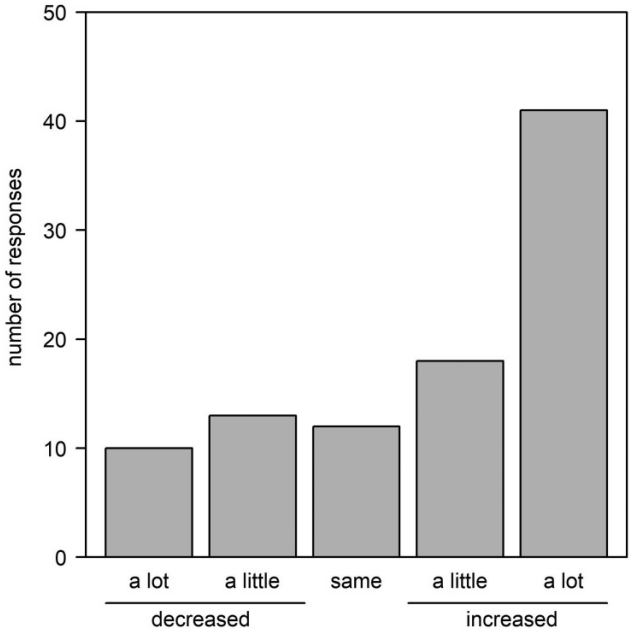
2021*a*). Fishers generally recognize that their catch of large cod has been curtailed by these actions and likely do not appreciate the significant loss of older fish in the population. In addition, the decline in juvenile recruitment is essentially undetectable to the fishery, given the large regulated minimum mesh (16.5 cm) and hook (12/0 circle) sizes. The decline in medium-sized fish (e.g., "scrod" and "market" cod) has been less than for large and sub-legal cod, and a reduction in the minimum fish size (from 56 to 48 cm in 2013) has allowed for more of these fish to be landed. These layers of fishing regulations influence how captains observe the fish population and should be acknowledged when interpreting fisher perspectives.

The telephone survey also revealed several factors that were correlated with perceptions of population trend. Captains with heightened levels of distress were more likely to perceive that cod populations increased. Greater distress was in turn associated with lack of income diversity (i.e., alternative employment opportunities) and a larger number

Table 4. Percent change in total stock abundance (*N*) and spawning stock biomass (SSB) between survey periods for two stock assessment models (Model 1 = constant natural mortality; Model 2 = increasing natural mortality) updated at two different points in time (TY18 = terminal year 2018; TY19 = terminal year 2019), as compared to the IBS trawl survey. Confidence interval (at 95%) is shown in parentheses.

	Total abundance (*N*)		Spawning stock biomass (SSB)	
Model 1 (TY18)	−68%	−(62%–75%)	−68%	−(61%–74%)
Model 1 (TY19)	−76%	−(72%–81%)	−79%	−(75%–83%)
Model 2 (TY18)	−75%	−(70%–81%)	−74%	−(69%–79%)
Model 2 (TY19)	−80%	−(76%–84%)	−80%	−(77%–83%)
Trawl survey	−78%	−(68%–84%)	−81%	−(75%–87%)

Fig. 6. Results of 2018 telephone survey of Federal multispecies groundfish permit holders. Interviewees were asked for their opinion on the direction and magnitude of change in the Gulf of Maine cod stock over the prior decade.



of household dependents (Scyphers et al. 2019), suggesting that financially troubled individuals perceived higher catch rates of cod during the more recent period. The discarding of legal-sized fish is prohibited under ACL management (2010–present), and each marketable cod captured beyond a vessel's annual allocation requires either "leasing" quota from other permit holders (often at prices exceeding the market value of the catch) or an end to their fishing year. This means that large catches of cod went from having positive associations (i.e., increased revenue) to negative associations (i.e., increase costs) between periods, which likely affected perceptions of trend (Tversky and Kahneman 1973; Orensanz et al. 2014). However, it remains unclear whether financial distress caused recent cod catches to appear more significant than they were, or whether these individuals experienced financial distress because of an actual increase in cod catch. The association between distrust in the NEFSC (i.e., stock assessments) and the perception of population increase could be the result of another unintentional cognitive influence, known as a *confirmation bias*, or the tendency to interpret new information in a way that supports previously held beliefs (Nickerson 1998). In other words, distrust earned from several years of inconsistent and uncertain assessment results likely caused some fishermen to categorically disbelieve the repeated scientific determination of severe depletion, even as their own catch rates eventually began to decline (Brooks and Legault 2016).

Although the fishery perspective may be subject to significant biases, the scientific community cannot claim ownership of the truth when assessment models provide catch advice that persistently results in overfishing, despite the reported catch remaining within assessment-based catch limits (Wiedemann and Jensen 2018). While the IBS survey and assessment models were in agreement on a declining population trend, our analyses suggest that the assessment's view of the population age structure does not match that of the IBS trawl survey. Both assessment models underestimated the contribution of older individuals to the population, leading to an underestimate of the SSB relative to the IBS survey estimate. Both assessment models also estimated considerably higher numbers of ages 1 and 2 cod, particularly during Period 2. These discrepancies in age structure suggest that some age- or size-based processes may be misspecified in the assessment model, such as maturity, natural mortality, weight-at-length, or fishery selectivity. Fishery selectivity is perhaps the most critical age-based process in an assessment model because if incorrectly specified; it can strongly influence management advice (Maunder et al. 2014; Maunder and Piner 2017) and lead to retrospective patterns (Hurtado-Ferro et al. 2014). In a recent separate analysis, we provided evidence that this assessment incorrectly assumes a "flat-topped" selection curve and that selectivity changed significantly between the two IBS periods, whereas the assessment assumes no change from 2005 to present (Dean et al. 2021*a*). Although the misreporting of catch in this stock (Palmer 2017) may also be contributing to a difference in scale between assessment and IBS survey, this factor is unlikely to be the root cause of the observed differences in age structure. Regardless, the general agreement with the IBS survey in terms of population decline and overall scale suggests that the assessment models are correctly accounting for much of the population dynamics. However, our analyses call into question the ability of current models to accurately describe the population age structure, which may be contributing to the consistently poor management outcomes.

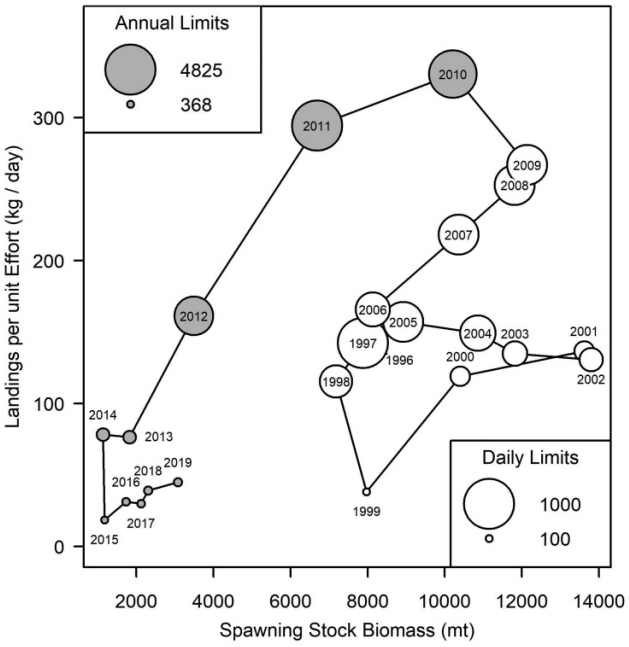
Estimates of absolute population size based on extrapolations of the area-swept by a trawl survey are often imprecise and subject to several potential biases due to the necessary simplifying assumptions (McAllister 1998). Although we conducted experiments to estimate and account for footrope escapement and the herding effect of the IBS trawl doors and sweeps (Dean et al. 2021*b*), we assumed that other sources of trawl efficiency were negligible. Escapement above the 4.5 m headrope height of the IBS survey trawl was considered unlikely because cod typically dive toward the seafloor when approached by mobile fishing gear (Handegard et al. 2003; Handegard and Tjøstheim 2005), and electronically tagged cod in the Gulf of Maine typically remain within 2 m of the seafloor during the day, when all MADMF survey tows were conducted (Dean et al. 2014). The 5 cm mesh liner of the IBS survey trawl may have allowed some smaller age-1 cod to escape through the net, leading to an underestimate for this age class. However, the IBS trawl was still highly capable of capturing a significant fraction of these younger fish, given that 1-year-old cod were the most abundant age class observed during Period 1. The assumption of negligible amounts of age-1+ cod shoreward of both the IBS and NEFSC surveys could also lead to the survey-based approach being an underestimate of total abundance. By conducting multiple short survey cruises per year, we sought to provide replicate

Table 5. Pearson correlation between stock assessment (terminal year = 2019) estimates of population size (SSB1 from Model 1; SSB2 from Model 2), fishery catch rates (LPUE), and metrics of fishery targeting of cod. Significant correlations ($p < 0.05$) are identified by an asterisk. The degrees of freedom (*df*) for the correlation test are shown in the last column.

	SSB1	SSB2	LPUE	% of trips targeting cod	Distance from peak cod area	Fishery footprint	*df*
Daily limits	−0.04	−0.19	0.71*	0.58*	−0.53	−0.43	11
Annual limits	0.86*	0.85*	0.97*	0.97*	−0.88*	−0.87*	8
Daily + annual limits[a]	0.91*	0.90*	0.88*	0.83*	−0.75*	−0.77*	20
SSB1		0.99*	0.61*	0.74*	−0.54*	−0.64*	22
SSB2	0.99*		0.52*	0.68*	−0.49*	−0.59*	22
LPUE	0.61*	0.52*		0.94*	−0.84*	−0.86*	22
% of trips targeting cod	0.74*	0.68*	0.94*		−0.91*	−0.93*	22
Distance from peak cod area	−0.54*	−0.49*	−0.84*	−0.91*		0.97*	22
Fishery footprint	−0.64*	−0.59*	−0.86*	−0.93*	0.97*		22

[a]Correlation estimated from a simple linear model with a dummy variable.

Fig. 7. Relationship between landings per unit effort (kg/day) and spawning stock biomass (mt) from assessment model 1 between 1996 and 2019. The size of each bubble is proportional to the harvest limit in that year (white bubbles = daily landing limits; gray bubbles = annual catch limits).



measures of abundance that minimized the influence of fish movement (i.e., non-stationarity) and to describe the spatio-temporal patterns in distribution. During the earlier period, this required multiple vessels operating simultaneously to cover the broader study area, which could have introduced unique vessel effects; however, net mensuration and vessel data (tow speed, length, and direction) do not suggest significant differences between vessels. Finally, a mismatch in the assumed time of year for estimates of total abundance could have contributed to a scale difference between the assessment (assumed January 1) and the IBS survey (averaged across various points in the year). While the combination

Fig. 8. Targeting of Atlantic cod in the Gulf of Maine multispecies commercial groundfishery: [Top] Annual % of total commercial groundfish trips in the Gulf of Maine, by primary target species. "Primary target" means the species that generated the greatest landings value on a trip. [Bottom] Average fishery footprint (95% contour from a kernel density utilization distribution), and average distance from the center of the 10-min "square" of latitude and longitude with the greatest cod landings.

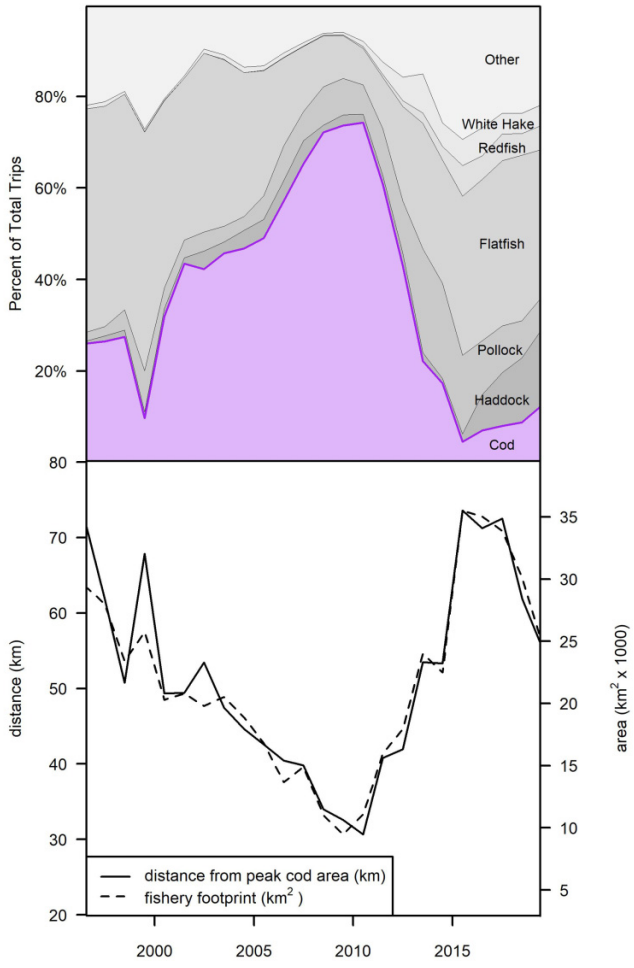
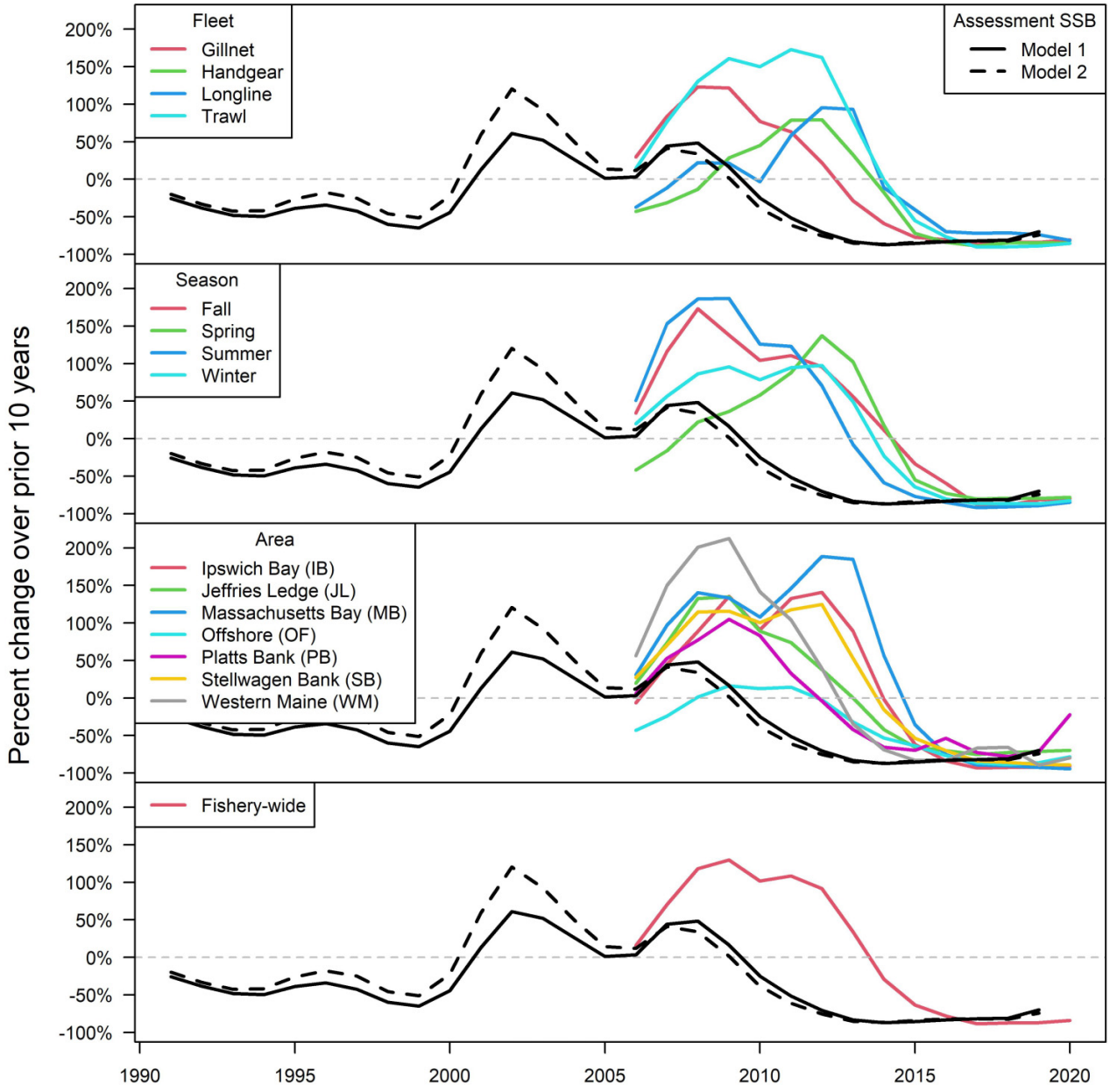


Fig. 9. Trailing decadal % change in spawning stock biomass (i.e., $\left(\frac{SSB_y}{SSB_{y-10}} - 1\right) * 100$) from the current stock assessment (black lines) as compared to the trailing decadal % change in mean fishery-reported landings per day (colored lines).



of these factors complicates the comparison of estimates of population size on an absolute scale, the relative differences in trend and age distribution should be less vulnerable to these effects.

During the period when the fishery and stock assessments witnessed dramatically different trends (2006–2016), disagreement between fishers and government scientists caused significant conflict (Acheson and Gardner 2014) and distress (Scyphers et al. 2019). Concurrently, a series of stock assessment updates led to dramatic shifts in the scientific perspective on stock status and trajectory (Mayo et al. 2009; NEFSC 2011), undermining fishery confidence in the assessment-based management system. Subsequent fishery opposition to harvest restrictions and countering lawsuits from environmental advocacy groups slowed the development and implementation of management actions to bring harvest down to a sustainable level (Rosenberg 2003; Acheson and Gardner 2011), resulting in a rapid increase in the fishing mortality rate to more than 12× the overfishing threshold (NEFSC 2021). This is a clear example of how the erosion of social capital, in the form of distrust, leads to a more dysfunctional fishery management system.

Another lesson from this study is that the potential for unintended consequences should be carefully considered when modifying fishing regulations. The fishery response (increased targeting) to raising daily limits was rational and

could have been anticipated (Richards 1994; Ackley and Heifetz 2001). Given the market value of cod, combined with the proximity and persistence of the remaining areas of abundance, why would fishermen not seek to fill their limit, particularly as their allocation of DAS (and potential earnings) was being curtailed? In fact, the logic of increasing trip limits to minimize discards (and ultimately mortality) is questionable and assumes no change in the targeting behavior of fishermen. Likewise, management actions should be routinely evaluated post hoc to determine their effectiveness (Walters 2007). Many regulations such as minimum fish size, mesh size, time/area closures, and trip limits are frequently modified in this fishery with little understanding of their consequences. Recognizing when a regulation change causes more harm than good will help us avoid repeating past mistakes. However, this is difficult to do in practice because the complexity of the system makes it difficult to acknowledge whether a problem exists, let alone identify the underlying mechanisms or even recognize when the problem has been resolved (Jentoft and Chuenpagdee 2009). For this reason, rebuilding a depleted fish stock has been described as a particularly "wicked problem" that tends to reappear and lacks a clear solution (Khan and Neis 2010).

Regardless, achieving an understanding of divergent stock perspectives can still help manage the sustainable exploitation of this and other fish stocks. A primary element of difficult-to-solve "wicked problems" is a discrepancy between stakeholder perspectives (Hare 2020) because lack of a shared knowledge base inhibits consensus building in management (Adams et al. 2003; Innes 2004). Translating between the perspectives of the scientific and fishing communities helps both groups better recognize the common signal that underlies these disparate sets of observations (Daw et al. 2015). However, it is important that in doing so scientists and environmental advocates avoid the trap of assuming assessment models are truth (Rose 1997; Scholz and Wellmer 2021). Stock assessments are typically thorough and transparent about uncertainty, yet this does not mean that assessment models are free from invalid assumptions that could introduce meaningful biases. Confronting models with external data is one way to evaluate the validity of these assumptions and assessment results. Large-scale and long-term cooperative research projects, such as the MADMF Industry-Based Survey, can help identify biases in both perspectives in a constructive way that is hopefully credible to all stakeholders (Hartley and Robertson 2006). The *process* of working collaboratively to find answers may also help to build trust and unify perspectives (increasing social capital), making complex fisheries problems easier to solve (Orensanz et al. 2014; Daw et al. 2015). Unfortunately, the results of the phone survey of fishery perceptions suggest that the IBS trawl survey has done little to unify perspectives on Gulf of Maine cod thus far. However, it should be noted that the phone survey of fisher perceptions occurred more than a year before the completion of the IBS trawl survey and the fishing community has yet to be confronted with the final results of this cooperative research project.

In conclusion, while it is clear from multiple lines of evidence that the Gulf of Maine cod stock has declined substantially, divergent perspectives on stock status still represent a major challenge to fishery management. The management community should recognize that fishery misconceptions about population status are due in large part to the effect of regulations and a distrust of inconsistent assessment results. A divergence in perspectives may be an unavoidable consequence of fishery management yet acknowledging the underlying mechanisms might help us avoid future conflict.

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Data availability

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References

Abbott, J.K., and Haynie, A.C. 2012. What are we protecting? Fisher behavior and the unintended consequences of spatial closures as a fishery management tool. Ecol. Appl. **22**: 762–777. doi:10.1890/11-1319.1. PMID: 22645809.

Acheson, J., and Gardner, R. 2014. Fishing failure and success in the Gulf of Maine: lobster and groundfish management. Marit. Stud. **13**: 1–21. doi:10.1186/2212-9790-13-8.

Acheson, J.M., and Gardner, R. 2011. Modeling disaster: The failure of the management of the New England groundfish industry. North Am. J. Fish. Manag. **31**: 1005–1018. doi:10.1080/02755947.2011.635119.

Ackley, D.R., and Heifetz, J.C.N.-A. 2001. Fishing practices under maximum retainable bycatch rates in Alaska's groundfish fishery. Alaska Fish. Res. Bull. **8**: 22–44.

Adams, W.M., Brockington, D., Dyson, J., and Vira, B. 2003. Managing tragedies: understanding conflict over common pool resources defining resource management problems. Science, **302**: 1915–1916. doi:10.1126/science.1087771 10.1126/science.1087771.

Alverson, D.L., and Pereyra, W.T. 1969. Demersal fish explorations in the Northeastern Pacific Ocean—an evaluation of exploratory fishing methods and analytical approaches to stock size and yield forecasts. J. Fish. Res. Board Canada **26**: 1985–2001. doi:10.1139/f69-188.

Azzurro, E., Sbragaglia, V., Cerri, J., Bariche, M., Bolognini, L. Ben Souissi, J., et al. 2019. Climate change, biological invasions, and the shifting distribution of Mediterranean fishes: a large-scale survey based on local ecological knowledge. Glob. Chang. Biol. **25**: 2779–2792. doi:10.1111/gcb.14670. PMID: 31111639.

Benoît„ H.P., and Allard, J. 2009. Can the data from at-sea observer surveys be used to make general inferences about catch composition and discards? Can. J. Fish. Aquat. Sci., **66**(12): 2025–2039. doi: 10.1139/F09-116,

Berg, C.W., and Kristensen, K. 2012. Spatial age-length key modelling using continuation ratio logits. Fish. Res. **129**: 119–126. doi:10.1016/j.fishres.2012.06.016.

Bevilacqua, A.H.V., Carvalho, A.R., Angelini, R., and Christensen, V. 2016. More than anecdotes: Fishers' ecological knowledge can fill gaps for ecosystem modeling. PLoS ONE, **11**: e0155655. doi:10.1371/journal.pone.0155655. PMID: 27196131.

Branch, T.A., and Hilborn, R. 2008. Matching catches to quotas in a multispecies trawl fishery: targeting and avoidance behavior under individual transferable quotas. Can. J. Fish. Aquat. Sci. **65**(7): 1435–1446. doi:10.1139/F08-065.

Branch, T.A., Rutherford, K., and Hilborn, R. 2006. Replacing trip limits with individual transferable quotas: implications for discarding. Mar. Policy, **30**(3): 281–292. doi:10.1016/j.marpol.2004.12.003.

Brooks, E.N., and Legault, C.M. 2016. Retrospective forecasting—evaluating performance of stock projections. Can. J. Fish. Aquat. Sci. **73**(6): 935–950. doi:10.1139/cjfas-2015-0163.

Cardinale, M., and Svedäng, H. 2008. Mismanagement of fisheries: policy or science? Fish. Res. **93**: 244–247. doi:10.1016/j.fishres.2008.05.010.

Carr, L.M., and Heyman, W.D. 2012. "It's about seeing what's actually out there": quantifying fishers' ecological knowledge and biases in a small-scale commercial fishery as a path toward co-management. Ocean Coastal Manag. **69**: 118–132. doi:10.1016/j.ocecoaman.2012.07.018.

Daw, T.M., Robinson, J., and Graham, N.A.J. 2015. Perceptions of trends in Seychelles artisanal trap fisheries: comparing catch monitoring, underwater visual census and fishers' knowledge. Environ. Conserv. **38**: 75–88. doi:10.1017/s0376892914000149.

de Nooy, W. 2013. Communication in natural resource management: agreement between and disagreement within stakeholder groups. Ecol. Soc. **17**: 505–523. doi:10.5751/ES-05648-180244.

Dean, M.J., Elzey, S.P., Hoffman, W.S., Buchan, N.C., and Grabowski, J.H. 2019. The relative importance of sub-populations to the Gulf of Maine stock of Atlantic cod. ICES J. Mar. Sci. **76**: 1626–1640. doi:10.1093/icesjms/fsz027.

Dean, M.J., Hoffman, W.S., Buchan, N.C., Cadrin, S.X., and Grabowski, J.H. 2021*a*. Deconstructing size selectivity to evaluate the influence of fishery management. Fish. Res. **234**: 105782. doi:10.1016/j.fishres.2020.105782.

Dean, M.J., Hoffman, W.S., Buchan, N.C., Cadrin, S.X., and Grabowski, J.H. 2021*b*. The influence of trawl efficiency assumptions on survey-based population metrics. ICES J. Mar. Sci. **78**: 2858–2874. doi:10.1093/icesjms/fsab164.

Dean, M.J., Hoffman, W.S., Zemeckis, D.R., and Armstrong, M.P. 2014. Fine-scale diel and gender-based patterns in behaviour of Atlantic cod (Gadus morhua) on a spawning ground in the Western Gulf of Maine. ICES J. Mar. Sci. **71**(6): 1474–1489. doi:10.1093/icesjms/fsu040.

Decelles, G.R., Martins, D., Zemeckis, D.R., and Cadrin, S.X. 2017. Using fishermen's ecological knowledge to map Atlantic cod spawning grounds on Georges Bank. ICES J. Mar. Sci. **74**(6): 1587–1601. doi:10.1093/icesjms/fsx031.

Deroba, J.J. 2014. Evaluating the consequences of adjusting fish stock assessment estimates of biomass for retrospective patterns using Mohn's Rho. North Am. J. Fish. Manag.. **34**: 380–390. doi: 10.1080/02755947.2014.882452.

Dobbs, D. 2000. The great gulf: fishermen, scientists, and the struggle to revive the world's greatest fishery. Island Press, Washington DC.

Drew, J.A. 2005. Use of traditional ecological knowledge in marine conservation. Conserv. Biol. **19**: 1286–1293. doi:10.1111/j.1523-1739.2005.00158.x.

Erisman, B.E., Allen, L.G., Claisse, J.T., Pondella, D.J., Miller, E.F., Murray, J.H., and Walters, C. 2011. The illusion of plenty: hyperstability masks collapses in two recreational fisheries that target fish spawning aggregations. Can. J. Fish. Aquat. Sci. **68**(10): 1705–1716. doi:10.1139/f2011-090.

Friedman, W.J. 1993. Memory for the time of past events. Psychol. Bull. **113**: 44–66. doi:10.1037//0033-2909.113.1.44.

Fulton, E.A., Smith, A.D.M., Smith, D.C., and Van Putten, I.E. 2011. Human behaviour: The key source of uncertainty in fisheries management. Fish Fish. **12**: 2–17. doi:10.1111/j.1467-2979.2010.00371.x.

Gillis, D.M., Rijnsdorp, A.D., and Poos, J.J. 2008. Behavioral inferences from the statistical distribution of commercial catch: patterns of targeting in the landings of the Dutch beam trawler fleet. Can. J. Fish. Aquat. Sci. **65**: 27–37. doi:10.1139/F07-147.

Glenn, H., Tingley, D., Sánchez Maroño, S., Holm, D., Kell, L. Padda, G., et al. 2012. Trust in the fisheries scientific community. Mar. Policy **36**: 54–72. doi:10.1016/j.marpol.2011.03.008.

Handegard, N.O., and Tjøstheim, D. 2005. When fish meet a trawling vessel: examining the behaviour of gadoids using a free-floating buoy and acoustic split-beam tracking. Can. J. Fish. Aquat. Sci. **62**(10): 2409–2422. doi:10.1139/f05-131.

Handegard, N.O., Michalsen, K., and Tjøstheim, D. 2003. Avoidance behaviour in cod (Gadus morhua) to a bottom-trawling vessel. Aquat. Living Resour. **16**(3): 265–270. doi:10.1016/S0990-7440(03)00020-2.

Hare, J.A. 2020. Ten lessons from the frontlines of science in support of fisheries management. ICES J. Mar. Sci. **77**: 870–877. doi:10.1093/icesjms/fsaa025.

Harley, S.J., Myers, R. a., and Dunn, A. 2001. Is catch-per-unit-effort proportional to abundance? Can. J. Fish. Aquat. Sci. **58**(9): 1760–1772. doi:10.1139/cjfas-58-9-1760.

Hartley, T.W., and Robertson, R.A. 2006. Stakeholder engagement, cooperative fisheries research and democratic science: the case of the Northeast Consortium. Hum. Ecol. Rev. **13**: 161–171.

Hilborn, R. 2007. Managing fisheries is managing people: what has been learned? Fish Fish. **8**: 285–296. doi:10.1111/j.1467-2979.2007.00263_2.x.

Hjort, J. 1914. Fluctuations in the great fisheries of Northern Europe viewed in the light of biological research. ICES, **20**: 1–228.

Hønneland, G. 2000. Compliance in the Barents Sea fisheries. how fishermen account for conformity with rules. Mar. Policy **24**: 11–19. doi:10.1016/S0308-597X(98)00058-X.

Horowitz, J., Pressey, R.L., Gurney, G.G., Wenger, A.S., and Pahang, K.A. 2018. Investigating stakeholder perceptions of fish decline: making sense of multiple mental models. Sustainability, **10**: 1222. doi:10.3390/su10041222.

Huang, L., Ray, S., Segerson, K., and Walden, J. 2018. Impact of collective rights-based fisheries management: evidence from the New England groundfish fishery. Mar. Resour. Econ. **33**: 177–201. doi:10.1086/697478.

Hurtado-Ferro, F., Szuwalski, C.S., Valero, J.L., Anderson, S.C., Cunningham, C.J. Johnson, K.F., et al. 2014. Looking in the rear-view mirror: bias and retrospective patterns in integrated, age-structured stock assessment models. ICES J. Mar. Sci. **72**(1): 99–110. doi:10.1093/icesjms/fsu198.

Innes, J.E. 2004. Consensus building: clarifications for the critics. Plann. Theory **3**: 5–20. doi:10.1177/1473095204042315.

Jensen, A.C. 1972. The cod: the uncommon history of a common fish and its impact on American life from Viking times to present. Thomas Y. Crowell Company, New York.

Jentoft, S., and Chuenpagdee, R. 2009. Fisheries and coastal governance as a wicked problem. Mar. Policy, **33**: 553–560. doi:10.1016/j.marpol.2008.12.002.

Khan, A.S., and Neis, B. 2010. The rebuilding imperative in fisheries: clumsy solutions for a wicked problem? Prog. Oceanogr. **87**: 347–356. doi:10.1016/j.pocean.2010.09.012.

Kurlansky, M. 1997. Cod: A biography of the fish that changed the world. Penguin Books, New York .

Lucey, S.M., and Fogarty, M.J. 2013. Operational fisheries in New England: linking current fishing patterns to proposed ecological production units. Fish. Res. **141**: 3–12. doi:10.1016/j.fishres.2012.05.002.

Maunder, M.N., and Piner, K.R. 2017. Dealing with data conflicts in statistical inference of population assessment models that integrate information from multiple diverse data sets. Fish. Res. **192**: 16–27. doi:10.1016/j.fishres.2016.04.022.

Maunder, M.N., Crone, P.R., Valero, J.L., and Semmens, B.X. 2014. Selectivity: theory, estimation, and application in fishery stock assessment models. Fish. Res. **158**: 1–4. doi:10.1016/j.fishres.2014.03.017.

Mayo, R.K., Shepherd, G., O'Brien, L., Col, L.A., and Traver, M. 2009. The 2008 assessment of the Gulf of Maine Atlantic cod (Gadus morhua) stock. Northeast Fish. Sci. Cent. Ref. Doc. **09–03**: 1–128.

McAllister, M.K. 1998. Modeling the effects of fish migration on bias and variance in area-swept estimates of biomass: a vector-based approach. Can. J. Fish. Aquat. Sci. **55**: 2622–2641. doi:10.1139/f98-126.

Mello, L.G., and Rose, G.A. 2005. Using geostatistics to quantify seasonal distribution and aggregation patterns of fishes: an example of Atlantic cod (*Gadus morhua*). Can. J. Fish. Aquat. Sci. **62**(3): 659–670. doi:10.1139/f04-227.

Millar, R.B., and Fryer, R.J. 1999. Estimating the size-selection curves of towed gears, traps, nets and hooks. Rev. Fish Biol. Fish. **9**(1): 89–116. doi:10.1023/A:1008838220001.

Mohn, R. 1999. The retrospective problem in sequential population analysis: an investigation using cod fishery and simulated data. ICES J. Mar. Sci. **56**: 473–488. doi:10.1006/jmsc.1999.0481.

Nenadovic, M., Johnson, T., and Wilson, J. 2012. Implementing the western Gulf of Maine area closure: the role and perception of fishers' ecological knowledge. Ecol. Soc. **17**(1): 20. doi:10.5751/ES-04431-170120.

Nickerson, R.S. 1998. Confirmation bias: a ubiquitous phenomenon in many guises. Rev. Gen. Psychol. **2**: 175–220. doi:10.1037/1089-2680.2.2.175.

Northeast Fisheries Science Center (NEFSC). 1989. Report of the Seventh NEFSC Stock Assessment Workshop (7th SAW). Northeast Fisheries Science Center, Woods Hole, MA.

Northeast Fisheries Science Center (NEFSC). 2011. 52nd Northeast Regional Stock Assessment Workshop (52nd SAW) assessment report. Northeast Fisheries Science Center, Woods Hole, MA.

Northeast Fisheries Science Center (NEFSC). 2012. 53rd Northeast Regional Stock Assessment Workshop (53rd SAW) assessment report. Northeast Fisheries Science Center, Woods Hole, MA.

Northeast Fisheries Science Center (NEFSC). 2013. 55th Northeast Regional Stock Assessment Workshop (55th SAW) assessment report. NEFSC Reference Document. Northeast Fisheries Science Center, Woods Hole, MA.

Northeast Fisheries Science Center (NEFSC). 2019. Operational assessment of 14 northeast groundfish stocks, updated through 2018. Northeast Fisheries Science Center, Woods Hole, MA.

Northeast Fisheries Science Center (NEFSC). 2021. Gulf of Maine Atlantic cod - 2021 update assessment report. Northeast Fisheries Science Center, Woods Hole, MA.

O'Leary, B.C., Smart, J.C.R., Neale, F.C., Hawkins, J.P., Newman, S., Milman, A.C., and Roberts, C.M. 2011. Fisheries mismanagement. Mar. Pollut. Bull. **62**: 2642–2648. doi:10.1016/j.marpolbul.2011.09.032. PMID: 22018881.

Orensanz, J., Parma, A.M., and Cinti, A. 2014. Methods to use fishers' knowledge for fisheries assessment and management. FAO Fish. Tech. Pap. **591**: 41–61.

Palmer, M.C. 2017. Vessel trip reports catch-area reporting errors: potential impacts on the monitoring and management of the Northeast United States groundfish resource. Northeast Fish. Sci. Cent. Ref. Doc. **17–02**: 1–47.

Pretty, J. 2003. Social capital and the collective management of resources. Science, **302**: 1912–1914. doi:10.1126/science.1090847.

Pulver, J.R., Stephen, J.A., Larkin, M.F., and Gray DiLeone, A.M. 2019. Retrospective analyses of commercial trip limit efficacy in the Southeastern USA. Mar. Coast. Fish. **11**: 414–422. doi:10.1002/mcf2.10094.

Richards, L.J. 1994. Trip limits, catch, and effort in the British Columbia rockfish trawl fishery.. North Am. J. Fish. Manag. **11**: 742–750. doi:10.1577/1548-8675(1994)014⟨0742:tlcaei⟩2.3.co;2.

Richardson, D.E., Palmer, M.C., Smith, B.E., and Cooper, A. 2014. The influence of forage fish abundance on the aggregation of Gulf of Maine Atlantic cod (Gadus morhua) and their catchability in the fishery. Can. J. Fish. Aquat. Sci. **14**: 1–14. doi:10.1139/cjfas-2013-0489.

Rose, G. 1997. Points of view: The trouble with fisheries science! Rev. Fish Biol. Fish. **370**(May 1996): 365–370. doi:10.1023/A:1018495929784.

Rose, G.a., and Kulka, D.W. 1999. Hyperaggregation of fish and fisheries: how catch-per-unit-effort increased as the northern cod (*Gadus morhua*) declined. Can. J. Fish. Aquat. Sci. **56**(S1): 118–127. doi:10.1139/cjfas-56-S1-118.

Rosenberg, A.A. 2003. Managing to the Margins: The Overexploitation of Fisheries. Front. Ecol. Environ. **1**: 102–106. doi:10.2307/3868037.

Runge, J. a., Kovach, A.I., Churchill, J.H., Kerr, L. a., Morrison, J.R. Beardsley, R.C., et al. 2010. Understanding climate impacts on recruitment and spatial dynamics of Atlantic cod in the Gulf of Maine: integration of observations and modeling. Prog. Oceanogr. **87**(1–4): 251–263. doi:10.1016/j.pocean.2010.09.016.

Saul, S., and Die, D. 2016. Modeling the decision-making behavior of fishers in the reef fish fishery on the West Coast of Florida. Hum. Dimens. Wildl. **21**: 567–586. doi:10.1080/10871209.2016.1198853.

Scholz, R.W., and Wellmer, F.W. 2021. Endangering the integrity of science by misusing unvalidated models and untested assumptions as facts: general considerations and the mineral and phosphorus scarcity fallacy. Sustain. Sci. **16**: 2069–2086. doi:10.1007/s11625-021-01006-w. PMID: 34462645.

Scyphers, S.B., Steven Picou, J., and Grabowski, J.H. 2019. Chronic social disruption following a systemic fishery failure. Proc. Natl. Acad. Sci. USA **116**: 22912–22914. doi:10.1073/pnas.1913914116. PMID: 31659050.

Seaman, D.E., Millspaugh, J.J., Kernohan, B.J., Brundige, G.C., Raedeke, K.J., and Gitzen, R.A. 1999. Effects of sample size on kernel home range estimates. J. Wildl. Manage. **63**: 739–747. doi:10.2307/3802664.

Sen, S., and Nielsen, J.R. 1996. Fisheries co-management: a comparative analysis. Mar. Policy **20**: 405–418. doi:10.1016/0308-597X(96)00028-0.

Sissenwine, M.P. 1984. Why do fish populations vary? *In* Exploitation of marine communities. *Edited by* R.M. May. Springer, Berlin. pp. 59–94. doi:10.1007/978-3-642-70157-3_3.

Trzcinski, M.K., Mohn, R., and Bowen, W.K. 2006. Continued decline of an Atlantic cod population: How important is gray seal predation? Ecol. Appl. **16**(6): 2276–2292. doi:10.1890/1051-0761(2006)016[2276:CDOAAC]2.0.CO;2. PMID: 17205904.

Tversky, A., and Kahneman, D. 1973. Availability: a heuristic for judging frequency and probability. Cogn. Psychol. **5**: 207–232. doi:10.1016/0010-0285(73)90033-9.

Verweij, M.C., van Densen, W.L.T., and Mol, A.J.P. 2010. The Tower of Babel: different perceptions and controversies on change and status of North Sea fish stocks in multi-stakeholder settings. Mar. Policy, **34**: 522–533. doi:10.1016/j.marpol.2009.10.008.

Walters, C.J. 2007. Is adaptive management helping to solve fisheries problems? Ambio, **36**: 304–307. doi:10.1579/0044-7447(2007)36[304:IAMHTS]2.0.CO;2. PMID: 17626467.

Wang, S.D., and Rosenberg, A.A. 1997. US New England groundfish management under the Magnuson-Stevens Fishery Conservation and Management Act. Mar. Resour. Econ. **12**: 361–366. doi:10.1086/mre.12.4.42629210.

Wiedenmann, J., and Jensen, O.P. 2018. Uncertainty in stock assessment estimates for New England groundfish and its impact on achieving target harvest rates. Can. J. Fish. Aquat. Sci. **75**: 342–356. doi:10.1139/cjfas-2016-0484.

Yin, Y., and Sampson, D.B. 2004. Bias and precision of estimates from an age-structured stock assessment program in relation to stock and data characteristics. North Am. J. Fish. Manag. **24**: 865–879. doi:10.1577/m03-107.1.

Appendix A—Age-length key model

To adopt the maturity-at-age and weight-at-age inputs used in the stock assessments, we developed an age-length key model to translate survey observations of density-at-length (D_l) to density-at-age (D_a), following the CRL approach of Berg and Kristensen (2012). This method uses a set of generalized additive models to predict the age of a fish given its length, in addition to other variables (e.g., day of year, latitude, longitude, depth). An age-length key model (as opposed to annual empirical age-length keys) was necessary to account for the seasonal growth that occurs within the 10-month observation window of the IBS survey data set as well as the spatial patterns in length-at-age due to sub-population structure (Dean et al. 2019). A candidate model set was considered that represented various possibilities for how length-at-age might vary in space and time, and the best fitting model was selected using the Bayesian Information Criterion (BIC). Candidate models were fit to all individual records of cod age and length from the Gulf of Maine stock area from both the IBS trawl survey and NEFSC spring and fall trawl surveys. Predictive ability of the selected model was assessed via 10-fold cross-validation. Functions for model fitting and prediction were adapted from the ICES DATRAS R package (https://rforge.net/DATRAS/).

The best fitting model included year (YFAC, as a factor), as well as nonlinear functions of length (LBIN), day of year (J), and location (LAT, LON) (Table A1). Once this model form was identified, the basis dimension for each smoothed term was varied to achieve an optimal level of complexity and to avoid overfitting of the data. Cross-validation results suggest that the selected model had a strong out-of-sample ability to predict age from length across all years and months (Figs. A1 and A2).

Table A1. Candidate set of age-length key models and associated equivalent degrees of freedom (edf) and BIC scores. The best-fitting model in bold was used to translate lengths to ages for the purpose of estimating population abundance from the trawl survey data sets.

Model	Formula	edf	BIC	ΔBIC
m37	**~s(LBIN) + s(YFAC,bs="re") + s(J,k = 3) + s(LON,LAT,k = 6)**	**132.3**	**12 143.4**	**0.0**
m34	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 4) + s(LON,LAT,k = 5)	129.3	12 180.4	37.0
m36	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 3) + s(LON,LAT,k = 5)	127.6	12 185.5	42.1
m35	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 3) + s(LON,LAT,k = 4)	120.7	12 217.0	73.7
m33	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 4) + s(LON,LAT,k = 4)	122.8	12 217.5	74.1
m39	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 3) + s(LON,LAT,k = 4) + s(DEPTH_M,k = 3)	136.4	12 224.2	80.9
m22	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 4) + s(LON,LAT)	185.0	12 402.1	258.7
m15	~s(YFAC,bs="re") + te(J,LBIN,k = 3) + s(DEPTH_M,k = 3)	121.2	12 432.7	289.4
m21	~s(LBIN) + s(YFAC,bs="re") + s(J) + s(LON,LAT)	192.6	12 449.8	306.4
m14	~s(YFAC,bs="re") + te(J,LBIN,k = 4) + s(DEPTH_M,k = 4)	132.0	12 461.0	317.6
m16	~s(YFAC,bs="re") + te(J,LBIN,k = 2) + s(DEPTH_M,k = 2)	131.0	12 486.7	343.3
m10	~s(LBIN) + s(YFAC,bs="re") + s(J,k = 4)	101.4	12 490.8	347.4
m18	~s(YFAC,bs="re") + te(J,LBIN,k = 4) + te(J,DEPTH_M,k = 4)	135.0	12 492.6	349.2
m20	~s(YFAC,bs="re") + te(J,LBIN,k = 4) + te(LBIN,DEPTH_M,k = 4)	140.2	12 494.2	350.9
m9	~s(LBIN) + s(YFAC,bs="re") + s(J)	105.2	12 512.2	368.9
m13	~s(YFAC,bs="re") + te(J,LBIN) + s(DEPTH_M)	145.1	12 542.8	399.4
m11	~s(LBIN) + s(YFAC,bs="re") + s(J) + s(DEPTH_M)	137.5	12 556.4	413.1
m17	~s(YFAC,bs="re") + te(J,LBIN) + te(J,DEPTH_M)	147.5	12 560.9	417.5
m24	~s(LBIN) + s(YFAC,bs="re") + s(J) + s(LON,LAT) + s(DEPTH_M)	213.0	12 574.8	431.5
m12	~s(LBIN) + s(YFAC,bs="re") + te(J,DEPTH_M)	142.9	12 613.3	469.9
m19	~s(YFAC,bs="re") + te(J,LBIN) + te(LBIN,DEPTH_M)	156.7	12 631.2	487.9
m38	~s(LBIN) + s(YFAC,bs="re") + te(J,LON,LAT)	221.3	12 764.5	621.1
m28	~s(LBIN) + s(YFAC,bs="re") + s(J) + te(LON,LAT,DEPTH_M)	241.5	12 817.3	673.9
m29	~s(LBIN) + s(YFAC,bs="re") + te(LON,LAT,J) + s(DEPTH_M)	248.2	12 918.1	774.8
m32	~s(LBIN) + PERIOD + s(J)	71.8	13 417.5	1274.1
m3	~s(LBIN) + s(J)	69.5	13 527.4	1384.0
m27	~s(LBIN) + s(YFAC,bs="re") + s(LON,LAT)	184.8	13 577.9	1434.5
m4	~te(J,LBIN)	80.9	13 620.0	1476.7
m26	~s(LBIN) + s(YFAC,bs="re")	89.0	13 668.9	1525.5
m30	~s(LBIN) + s(YFAC,bs="re") + s(LON,LAT) + s(DEPTH_M)	202.4	13 698.3	1555.0
m8	~s(LBIN) + s(YFAC,bs="re") + s(DEPTH_M)	125.2	13 779.4	1636.1
m25	~s(LBIN) + s(J,by = YFAC)	266.8	13 813.2	1669.8
m31	~s(LBIN) + PERIOD + s(LON,LAT)	147.1	14 608.2	2464.8
m6	~s(LBIN) + PERIOD	42.1	14 809.4	2666.1
m5	~s(LBIN) + s(LON,LAT)	139.8	14 835.2	2691.8
m7	~s(LBIN) + PERIOD + s(DEPTH_M)	76.8	14 889.4	2746.1
m2	~s(LBIN)	33.3	15 064.7	2921.4
m1	~LBIN	18.0	15 126.2	2982.8

Fig. A1. Observed vs. predicted age distributions by year from the combined IBS-NEFSC age-length data set, as determined through 10-fold cross-validation.

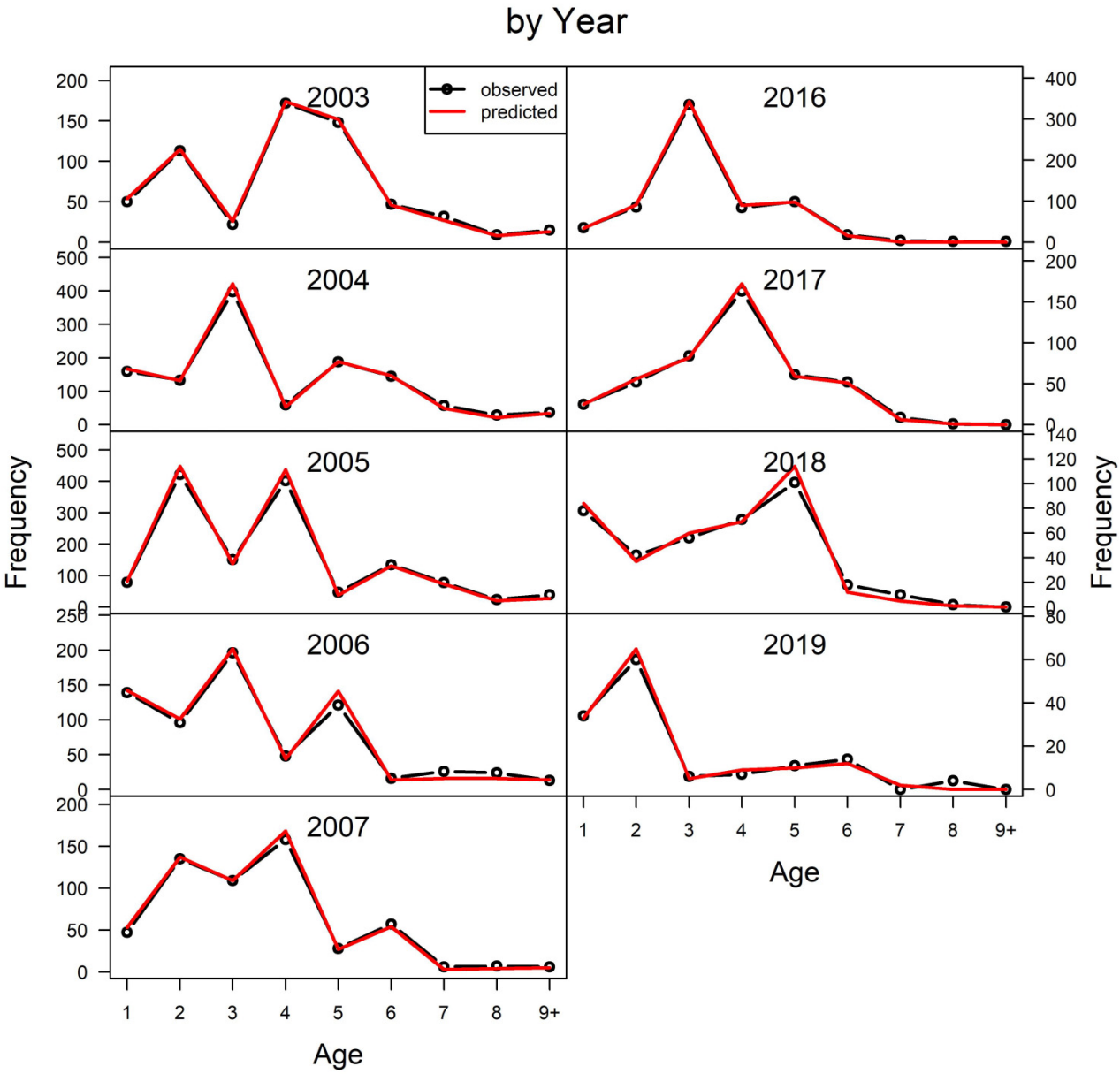

Fig. A2. Observed vs. predicted age distributions by month from the combined IBS-NEFSC age-length data set, as determined through 10-fold cross-validation.