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DMF News

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Inside

Haddock tagged and ready for release by *MarineFisheries* biologists and partners. (Photo courtesy of Steve De Neef.)

Haddock Heyday

MarineFisheries *promotes sustainable, rebuilt resource*

Good News

In recent years we have rarely heard positive news about the status of groundfish stocks in New England. The iconic cod stocks of the Gulf of Maine and Georges Bank have declined; scientific projections of several species of flatfish have been pessimistic; and both commercial and recreational fisheries have faced large reductions in catch limits for most groundfish species. However, there is a completely rebuilt species now more abundant in our New England waters than it has been in nearly 40 years—haddock! The haddock success story didn't happen overnight, but with some luck and the diligent efforts of fisheries scientists and managers, including those at *MarineFisheries*, haddock is incredibly abundant and now an excellent choice and example of sustainable seafood consumption.

Early History

As a component of New England fisheries, haddock has had a long and at times challenging history. Prior to the industrial revolution, when fishing was from schooners and the majori-

Did You Know?

Haddock (*Melanogrammus aeglefinus*) live near the ocean floor like other groundfish species—cod, flounder, and pollock are some more examples. These fish are distinguished by their silvery color and black lateral line running down the side of the body. Haddock also have a prominent dark spot over the pectoral fin, sometimes described as a thumbprint.

ty of captured fish were salted at-sea, cod dominated the seafood market and haddock was considered a less desirable product. That quickly changed in the early 1920s with the switch from sail to steam-powered vessels and the introduction of frozen fish fillets. Haddock took over the market, and for the first time in US history, fresh and frozen fish were available in regions far from fishing ports. During the 1920s, haddock landings nearly tripled, but it was quickly recognized that harvest was exceeding sustainable limits. By the 1930s, haddock landings had dropped significantly and the first management measures (increased net mesh sizes) were suggested.

The next couple of decades were defined by World War II, when fishing pressure decreased and profitability remained low. It was during this period, in 1949, that the International Convention for the Northwest Atlantic Fisheries (ICNAF) was ratified by the US and Canada, establishing a scientific and management body focused on haddock. By the 1960s, with the introduction of foreign fleets in US waters, catch rates on Georges Bank had reached historic high levels. Haddock harvest was nearly 250,000 tons in the early 1970s, with the majority being taken by foreign vessels to be landed in European ports. This prompted the US Congress to pass the 1976 Magnuson-Stevens Fishery Conservation and Management Act, excluding foreign fleets from US waters and beginning the current fisheries management regime in New England and throughout the US.

Haddock in the northwest Atlantic Ocean can be found from the Mid-Atlantic Bight to the Scotian Shelf, with the highest concentrations on Georges Bank, the Gulf of Maine, and the Canadian banks. Haddock are currently managed as two stocks in US waters: the Gulf of Maine stock ranging from north of Cape Cod, including Stellwagen Bank, to the Canadian border; and the Georges Bank stock, including the US portion of Georges Bank and southern New England. Stock sizes have fluctuated over the last several decades, but have been considered overfished for the majority of time since the early 1980s. The events of 2003 would change this, when the largest haddock year class since 1963 was observed on Georges Bank.

Year-Class Bonanzas

The unprecedented 1963 year class likely kept the Georges Bank haddock stock from total collapse during the increased fishing effort era of the 1970s; however, it presented a scientific challenge in determining the cause for such a large recruitment event that didn't happen again until 40 years later. The 2003 year class was nearly double the size of the 1963 year class, and questions about what caused these massive recruitment events still remained. Fortunately, less than a decade later, in 2010, another enormous year class was observed on Georges Bank, only to be surpassed by the largest year class ever observed in 2013. Similarly, the Gulf of Maine haddock stock had historic huge recruitment events in 2012 and 2013, and both stocks were declared rebuilt in 2008.

Stock Status

MarineFisheries has corroborated federal survey information about the high level of abundance of haddock in the Gulf of Maine through our second Industry-Based Survey (IBS2), which was launched in April 2016. Funded in part by the Groundfish Disaster Economic Assistance Program and Baker-Polito Administration, IBS2 is conducted from a commercial vessel in a portion of the Gulf of Maine. The focus of IBS2 has been on Gulf of Maine cod; however, the survey

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The Dish on Fish

Bringing locally caught and sustainable seafood to your dinner table

Haddock Ceviche

Always use the freshest fish possible. Make the same day you purchase fresh fish. During the marinating process, the fish will change from pinkish grey and translucent, to whiter in color and opaque.

Ingredients

- 2 lb. deboned, skinned haddock, cut into ½-inch pieces
- ½ cup of fresh squeezed lime juice
- ½ cup of fresh squeezed lemon juice
- ½ red onion, finely diced
- 1 cup of chopped, seeded tomatoes
- 1 chili pepper, seeded and finely diced
- 2 teaspoons of salt
- Dash of ground oregano
- Dash of Tabasco or a light pinch of cayenne pepper
- Cilantro
- Avocado
- Tortillas or tortilla chips

Directions

In a glass or ceramic bowl, place the haddock, onion, tomatoes, chili, salt, Tabasco, and oregano. Cover with lime and lemon juice. Let sit covered in the refrigerator for an hour, then stir, making sure all of the fish gets exposed to the lime and lemon juices. Let sit for several hours, giving time for the flavors to blend.

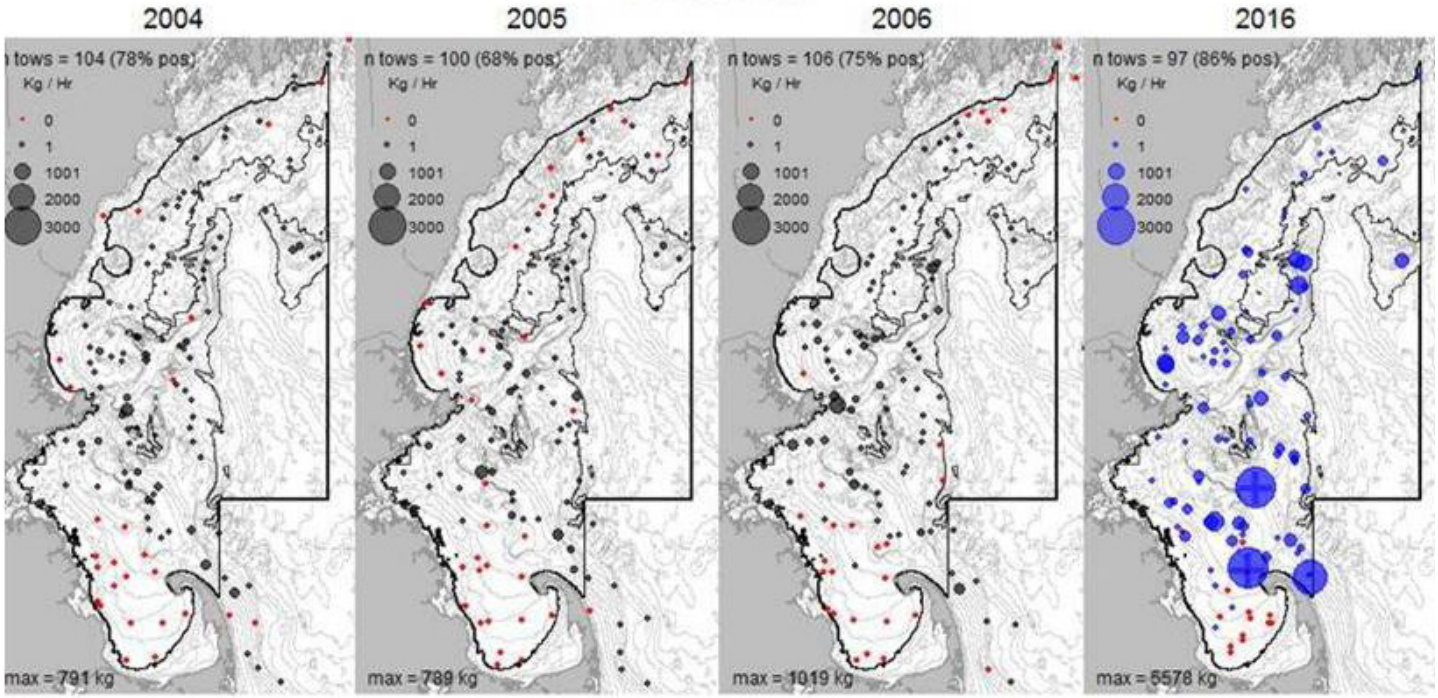
Serve with chopped cilantro, slices of avocado, and heated tortillas or tortilla chips.

Pilot Grant Program Launched by Seafood Marketing Program

The Seafood Marketing Program, still in its inaugural year, began a pilot grant program to promote local commercial fishing industries and communities. This pilot program was launched this fall as an additional way for *MarineFisheries* to support the work of individuals and organizations whose goals are parallel to those of the Seafood Marketing Program. The Division will be allocating $60,000 between multiple proposals that will be evaluated in early January.

Successful grant recipients will increase awareness and preference for Massachusetts seafood through direct consumer marketing to shift demand, or provide marketing support to local commercial fishing industries and communities to bolster their capabilities of marketing Massachusetts seafood. Examples of this undertaking include education, consumer engagement, promotion, new markets, technology, research, or community organization. Funding such projects widens the impact of the Seafood Marketing Program while allowing us to pursue our own priorities as shaped by our Steering Committee. For more information, please contact Wendy M. Zisson at wendy.mainardi@state.ma.us.

By Wendy M. Zisson, Seafood Marketing Program Coordinator



Distribution and abundance of haddock observed in the IBS1 (2004–2006) and the first spring leg of the IBS2 (2016) showing the nearly 10-fold increase in observed haddock abundance in the Gulf of Maine.

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is collecting information on a variety of species, including haddock. In the first spring season of IBS2, we saw nearly 10 times the catch rate of haddock as we did in our previous *MarineFisheries* IBS ten years ago. The survey is back on the water for the winter season, and we expect to get a much better handle on the magnitude of change in the haddock stock from the first IBS survey (2004–2006) to the current survey, as we complete more survey cruises.

MarineFisheries staff has also participated in assessing the status of the haddock stocks. Currently, the Georges Bank haddock stock assessment indicates the stock is not overfished (biomass is greater than target levels), and overfishing is not occurring (fishing mortality is lower than the management limit). It's estimated that over three billion haddock born in 2013 survived to reach age 1, marking the largest year class ever observed for this stock. As these young fish continue to grow, biomass is expected to increase even more in the near future. The most recent Gulf of Maine haddock stock assessment reached the same conclusion: not overfished, with no overfishing. Current biomass is estimated to be more than double the management target. Gulf of Maine haddock is expected to remain strong, offering increased fishing opportunities for recreational and commercial fishermen in the Gulf of Maine.

Optimal Harvest Choked Off

While there is very positive news about the status of haddock stocks, the historic high abundance levels have presented some challenges to scientists and managers. While haddock are often the target species for New England fishermen, they are typically caught as part of a mixed species fishery, along with cod, flounders, and other bottom-dwelling fish. Allocations of groundfish species to both recreational and commercial fishermen are affected by choke stocks—those species with low quotas that must be avoided. Constraining quotas of choke stocks, such as cod, yellowtail flounder, and windowpane flounder have prevented targeted haddock fisheries from harvesting the optimal yield of the healthy haddock stocks. For example, in 2015, New England fishermen caught less than 25% of the Georges Bank haddock quota. *MarineFisheries* staff participates on the New England Fishery Management Council (NEFMC) and the Council's Groundfish Plan Development Team and Committee, working towards solutions to maximize harvest of healthy haddock stocks under the constraints of low quotas for depleted stocks.

Gear Testing

Trawl gear modifications designed to separate haddock from cod and flatfish have been developed and tested as part of *MarineFisheries*' Conservation Engineering Program, in collaboration with UMass Dartmouth's School for Marine Science and Technology (SMAST) and the Marine Fisheries Institute. One example, the haddock separator trawl, is already in use and is a regulatory requirement to fish in special haddock access area programs on Georges Bank. Such gear designs are based on the differential behavior of the species to a fishing net; whereas haddock react by swimming upwards, cod and flatfish respond by swimming in a downward direction. The Conservation Engineering group is presently working on another gear system to encourage escapement of cod and juvenile haddock.

Post-Release Mortality

On the recreational side, *MarineFisheries* has participated in several studies aimed at getting a better understanding of recreationally-caught haddock and cod post-release mortality. Through acoustic telemetry and traditional mark-recapture methods, results indicate that the estimate of mortality from rod-and-reel caught haddock and cod is lower than currently assumed. These revised estimates have been used to inform the mortality estimates in the stock assessments for haddock and cod and can help improve management for the recreational fishing sector when targeting haddock. Additionally, we promote best handling practices for the recreational catch and release fishery.

Haddock Bycatch

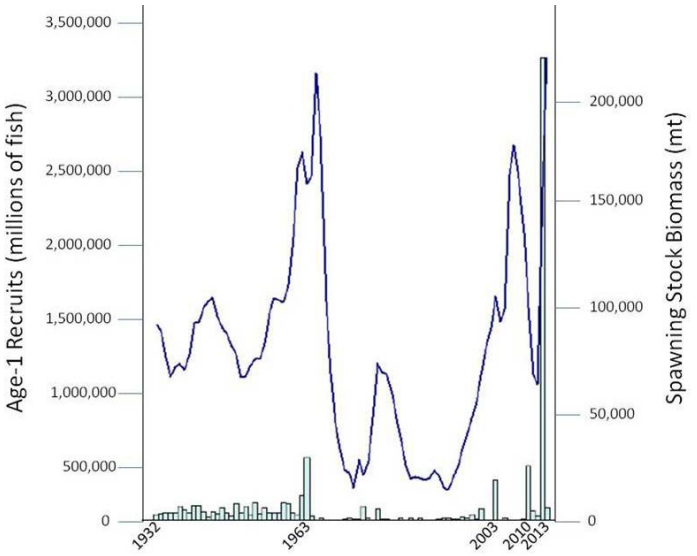
Bycatch of haddock in other fisheries has become a focal challenge in recent years due to the high abundance of the stocks. The small-mesh trawl fisheries, including those targeting herring, mackerel, and whiting have seen an increase in haddock bycatch in the majority of their traditional fishing grounds. Recognizing the importance of specific fishing areas and behaviors of these non-haddock-targeting fisheries, the NEFMC has assigned a portion of the haddock quota as bycatch. However, due to the large increase in abundance, bycatch allocations of haddock have been exceeded in recent years. *MarineFisheries* plays an important role in assisting to reduce haddock bycatch and maintain the interests of both the groundfish and

small-mesh fisheries.

This past spring, in response to input from herring and groundfish fishermen, as well as fisheries managers and the public, the coordinators of the *MarineFisheries* and SMAST River Herring Bycatch Avoidance (RHBA) program decided to expand sampling data communications to address herring fleet interactions with haddock. The RHBA's 12 participating mid-water trawl herring vessels received regular summaries of haddock bycatch trends (separate from the river herring bycatch communications that have been in place for several years), along with their vessel-specific data. Data from over 30 at-sea and shoreside-sampled trips were aggregated and relayed to the fleet throughout the Georges Bank fishing season.

As of mid-November 2016, only 22% of the Georges Bank herring fishery's haddock bycatch allocation had been caught—less than half of the poundage that had been caught through November 2015. These communications will continue to increase fleet awareness of current haddock bycatch levels and foster accountability with the goal of reducing bycatch. The portside sampling program and bycatch avoidance programs, which are funded through the Atlantic Herring Research Set-Aside (a program that allocates a portion of the total herring quota towards funding research), represent examples of how collaborative research can benefit the industry.

MarineFisheries also initiated a cooperative research project with the small-mesh whiting fishery. We're looking at potential seasonal changes to small-mesh trawl exemption areas in an effort to make them more effective based on changes in distribution and productivity of target and bycatch species, including haddock. As part of the Groundfish Disaster Economic Assistance Program, funds were set aside to assist groundfishermen to conduct experimental fishing and gather information on whiting catch and groundfish bycatch, like haddock. Changes to the exemption areas could increase harvest of whiting while reducing groundfish bycatch, benefitting the groundfish fisheries.

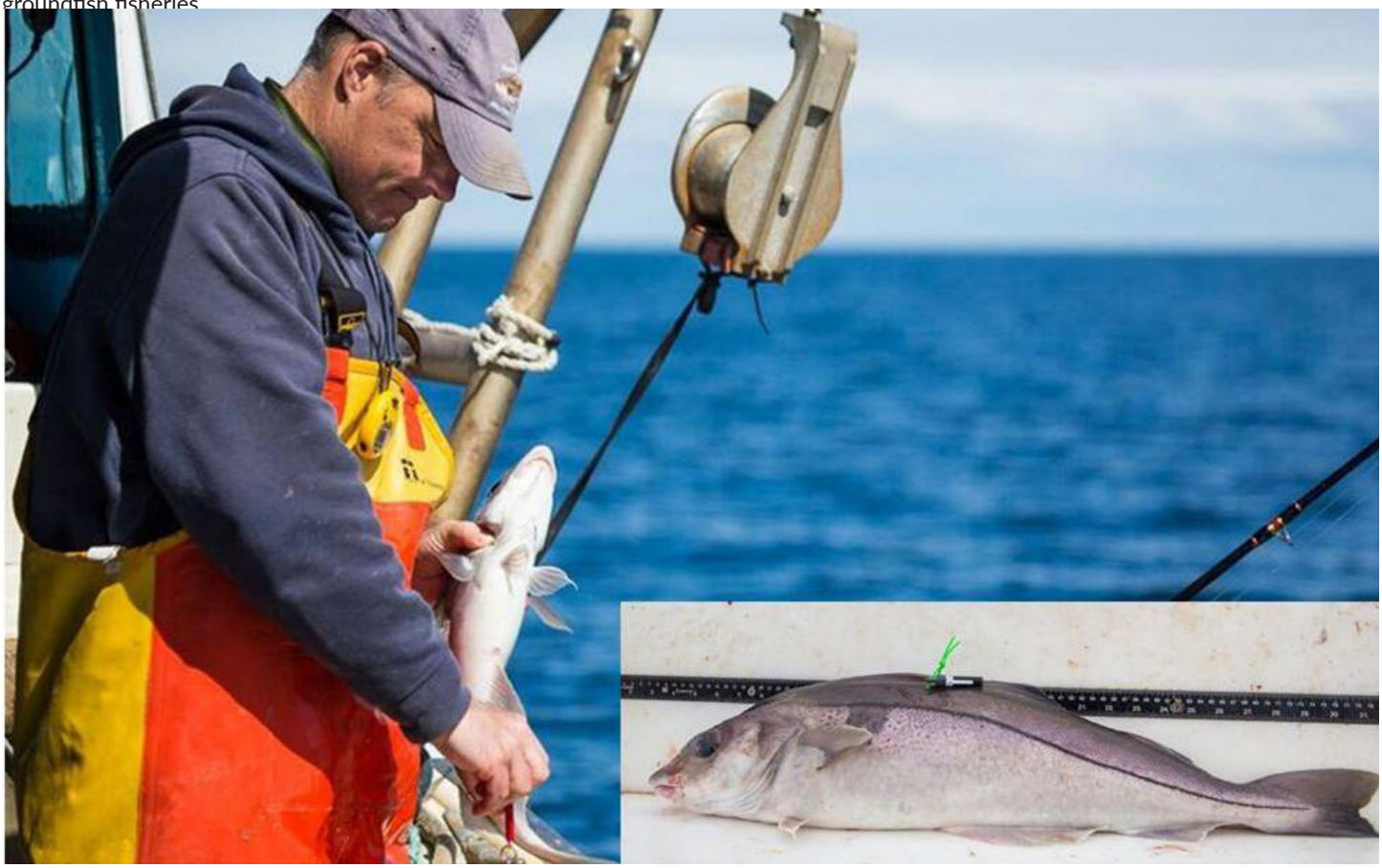


Georges Bank haddock recruits (bars) and biomass (line) 1932-2014, showing the large year classes of 1963, 2003 and 2010, and the massive year class of 2013. (Adapted from NEFSC Ref Doc 15-24).

Second to None

Despite the scientific and management challenges, there are excellent opportunities for seafood marketing and consumption. Often considered by consumers as a secondary product to cod, haddock actually has a similar flavor and texture; is locally caught and available; is sustainably harvested; and is less expensive.

Haddock is sold in different market classes: large, small, and scrod (a mix of legally-caught size classes). Prices range from approximately $6.00 to $15.00 per pound in fish markets throughout New England,



***MarineFisheries* biologist Bill Hoffman participates in a study to understand haddock post-release mortality using acoustic telemetry and tagging. (Photo courtesy of Steve De Neef.)**

and the majority of haddock on display in local grocery stores and fish markets is wild, fresh (not frozen) catch from New England waters. The Division's Seafood Marketing Program, launched in August 2016, highlights haddock's year round availability, and reminds folks that eating seafood twice a week provides essential vitamins and minerals and is an excellent source of protein. Haddock in particular is an excellent source of low-fat protein, magnesium, and selenium.

Cod will always be a critical component of New England fisheries and seafood consumption, but haddock shouldn't be overlooked. When people in the Midwest were introduced to frozen fish fillets in the 1920s, it was haddock they were eating and enjoying. We've come a long way from frozen fish sticks in how we enjoy our seafood. Consumers currently are more focused on fresh product including zesty fish chowders, grilled fillets, the classic combo of fish and chips, and lime-cooked ceviches (see page 2). With changing consumer tastes and improving stock status, haddock has returned as a staple of the New England seafood diet.

Conservation and Utilization

New England is facing management and marketing challenges associated with the rebuilt and abundant haddock stock. We anticipate similar challenges with additional groundfish stocks in the near future. Improving scientific understanding, optimizing yield, reducing bycatch, and promoting consumer awareness are critical components of determining the balance between conservation and utilization of New England's resources. *MarineFisheries* will continue to support science, management, and marketing to maintain that balance and promote the consumption of locally, wild harvested fish, such as haddock.

By Cate O'Keefe, Marine Science and Policy Analyst; Greg DeCelles, Stock Assessment Specialist; Micah Dean, Marine Fisheries Biologist; Brad Schondelmeier, Marine Fisheries Biologist; Melanie Griffin, Fisheries Management Specialist; and Wendy Mainardi, Seafood Marketing Coordinator.

New Members Appointed to Advisory Commission

For over 50 years, *MarineFisheries* has benefitted from the input and oversight of the Marine Fisheries Advisory Commission (MFAC), a nine-member citizen advisory board within the agency, as created by statute. The MFAC provides guidance to the Division's Director and is responsible for approving proposed regulatory changes for commercial and recreational fishing. Commissioners, representing various fishing interests throughout coastal Massachusetts, are appointed by the Governor to three-year terms. They serve without compensation, attending monthly business meetings as well as many public hearings.

During 2016, eight new members were appointed to the MFAC. We congratulate and thank them for their willingness to provide invaluable expertise to the agency. My staff and I look forward to working with the new Commissioners and Chairman Raymond Kane, the sole member with previous MFAC experience. The nine members are:

Kalil Boghdan of Hamilton has spent over 30 years as a high school biology teacher, science department chair, and middle school principal in the Hamilton-Wenham Regional School District. Additionally, he owns and operates a sportfishing charter operation, Downriver Charters, and holds a US Coast Guard Masters License.

William Doyle of Plymouth has been in the seafood industry since 1980. Previous roles include the Chief Administrator of the New England Fisheries Steering Committee, M.F. Foley Co., establishing and managing a new processing division of John Nagle Co., and serving as a consultant for Galleon Seafood. He has been involved with shellfish aquaculture as a co-owner of Plymouth Rock Oyster Growers and a wholesale dealer of shellfish.

Raymond Kane, Jr. (Chair) of Chatham has four decades of experience in marine operations and fisheries. Ray is the owner/operator of a commercial lobster and groundfish vessel, and is a member of several fishing organizations, including the Executive Committee of the Massachusetts Fishermen's Partnership. Ray is also an outreach spokesman for the Cape Cod Commercial Fishermen's Alliance.

Michael Pierdinock (Clerk) of Plymouth is a USCG Captain and the owner/operator of the charter boat *Perseverance* for 12 years, from which he targets inshore, offshore, and groundfish species. He serves on the Board of Directors of the Stellwagen Bank Charter Boat Association and actively participates in fishery management matters that impact recreational anglers and the for-hire industry.

Charles Quinn of South Dartmouth owns and manages five scallop vessels and a scallop gear fabrication business. He began fishing for scallops as a teenager and has previously crewed on a scallop vessel and captained his own vessel. He has been involved in the commercial fishing industry for more than 40 years.

Gus Sanfilippo of Gloucester is a commercial fisherman. He formerly owned an 80-foot trawler and remains active in his family's commercial fishing business. He has also worked in the construction industry and as a sales representative selling tug boats and barges.

Arthur "Sooky" Sawyer of Gloucester is a commercial fisherman and current president of the Massachusetts Lobstermen's Association. Sooky has over four decades of commercial fishing experience in both the lobster trap and the groundfish fisheries. He is the owner and operator of an active fishing vessel that operates from the port of Gloucester. Sooky also serves as an industry representative on the federal Large Whale Take Reduction Team.

Andrew Walsh of Stoughton is a commercial fisherman who participates in multiple state and federal mobile gear fisheries within the Commonwealth targeting groundfish, scallops, fluke, and squid. He worked as a crew member for a Boston-based fishing company before becoming a captain in 2007.

Louis Williams of Salem has owned and operated a commercial fishing business for close to 40 years, fishing with a variety of gears for groundfish, scallops, and lobster. He has previously served as a member of both the New England Groundfish Advisory Committee and the Northeast Seafood Coalition.

My staff and I also offer our sincere appreciation to former Commission members— Bill Adler, Mark Amorello, Vito Calomo, Chuck Casella, Joseph Huckemeyer, Edward Nasser, Domenic Santoro, and J. Randy Sigler—for all the work done on behalf of the Commonwealth and especially *MarineFisheries*. Many difficult and controversial marine fishery management decisions have been made easier due to their guidance. There is no substitute for thoughtful advice from those involved in our commercial and recreational fishing sectors. Past members have provided that guidance and many have led the charge on special initiatives such as the Massachusetts recreational saltwater fishing permits. We owe them a debt of gratitude.

By David E. Pierce, PhD, Director

Public Access Update

Our Public Access Project, funded by saltwater recreational permit fees, took some fantastic steps in the preservation and creation of fishing access along the coast of Massachusetts this past year. The project awarded funds for public access in five municipalities through its small grants initiative, rebuilt a fishing pier in Yarmouth, funded the deployment of a recreational fishing reef off the coast of Harwich, and supported a collaborative effort to liberalize management strategies for piping plovers, providing for enhanced beach access.

Small Grant Projects

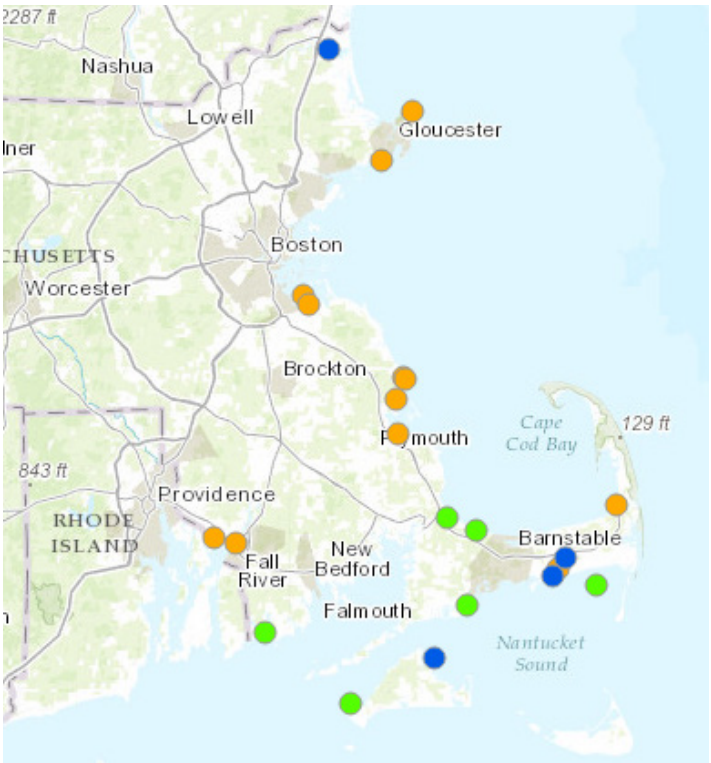
MarineFisheries has wrapped up its third year operating the Small Grants Project, through which municipalities apply for funds to support projects in their town that either create or enhance public access to saltwater fishing. This past year, five towns were awarded a total of $50,500:

- Plymouth, $6,000. The town built a fillet station at the State boat ramp that provides anglers with the ability to clean their catch and leave the fish racks for the local lobster fleet to use.
- Marshfield, $1,000. The town installed new lighting at the State boat ramp at Green Harbor.
- Gloucester, $15,000. The Harbormaster and local high school partnered to rebuild the float at Magnolia Pier in Gloucester. The plans were provided by a local engineering firm, parts and lumber were purchased locally with the grant money, and the float was constructed by local students.
- Rockport, $13,500. The Atlantic Path, an incredibly scenic trail along the town's coast, was cleared of brush and otherwise made more passable for shore-bound anglers.
- Dennis, $15,000. The town installed new floats and a gangway at the State boat ramp on the Bass River.

Large Cooperative Projects

In 2016, the Division undertook two big construction projects, the first of which rebuilt the South Street Bass River Fishing Pier in Yarmouth. This project included the complete redecking of the pier and the installation of new railings which are compliant with the Americans with Disabilities Act. This $220,000 improvement was cooperatively undertaken by *MarineFisheries*, the Office of Fishing and Boating Access, and the Town of Yarmouth. Within days of the pier's reopening, a fishing tournament took place and hundreds of eager anglers tossed their lines into the Bass River. In August, *MarineFisheries* hosted one of our many Youth Fishing Clinics at the revitalized pier.

Anglers at the newly improved South Street Bass River fishing pier.



Locations of all completed public access projects funded by recreational saltwater permits sales. Orange designate smalls grants, blue are large grants, and green are considered general items.

The second project was a cooperative effort with the Town of Harwich to deploy an artificial fishing reef just south of Harwich's Saquatucket Harbor (see *DMF News* 1st & 2nd Quarters 2016).

Additional Public Access Efforts

In addition to construction projects, *MarineFisheries* collaborated on a Habitat Conservation Plan that liberalizes management strategies for piping plovers. The three-year effort was led by Massachusetts Division of Fisheries and Wildlife and included at least 20 other groups including state and federal agencies and non-governmental organizations. Last summer, Orleans and Chatham were able to open beaches to over-sand vehicles during times of the summer that were historically closed due to the presence of pre-fledge piping plover chicks. This new management strategy is possible because of successful conservation efforts over the past two decades that have increased the numbers of piping plovers in Massachusetts.

Looking Forward

MarineFisheries has begun planning for public access improvements in 2017. Engineering for a new fishing pier on Deer Island in Boston Harbor took place over the past two years. This cooperative project with the City of Boston, Massachusetts Water Resource Authority, the Office of Fishing and Boating Access, and *MarineFisheries* is expected to soon be ready to enter the construction phase. This part of Boston Harbor is famous for great winter flounder and striped bass fishing.

More information on past public access projects and updates on future projects can be found on our website: http://www.mass.gov/eea/agencies/dfg/dmf/recreational-fishing/public-access.html.

By Ross Kessler, Public Access Coordinator

New How-To Videos for the Recreational Lobster Fishery

MarineFisheries has teamed up with professional lobstermen, conservation advocates, and federal partners to promote responsible recreational lobster fishing. A new series of short, entertaining, and professionally-produced videos explains recreational lobster permitting, gear, and regulations with special emphasis on marine debris. This video project is part of an ongoing initiative at the national and regional level to reduce—but more importantly prevent—marine debris.

Historically, the Division's lobstering materials have been limited to dedicated pages in the annual Recreational Fishing Guide that is widely distributed through our offices, tackle shops, and trade shows. However, many permit holders are unaware of these materials, especially if they obtain a permit online. Now anyone with a smart phone, tablet, or computer will have access to these videos and other Division materials.

Massachusetts has the largest recreational lobster fishery in New England, with approximately 3,900 permit holders who fish pots, resulting in approximately 25,000 vertical lines. Unfortunately, many participants give up on the activity after just one year. This high turnover causes the recreational lobster fishing sector to be the least experienced of all our fisheries. Many participants are in need of some coaching to both improve their catch success and prevent the loss of gear.

Our data show the average number of recreational traps fished is about seven per permit holder (up to 10 are allowed) and about 25% of the traps are reported lost. Recreational fishermen typically fish single traps (a buoy and line attached to every trap). This configuration leads to trap loss when the buoys are run over by vessels, or if the buoy lines are too short for the waters fished. Lost traps are problematic because they often continue to attract and kill lobsters and fish for months to years.

Fishing with traps is hard work—just ask your local commercial lobsterman! Most commercial lobstermen have learned the trade from a relative or an experienced waterman who taught them the ropes. There are many laws and regulations that apply both to the commercial and recreational fisheries that are designed to conserve lobster and minimize gear entanglements of protected species (turtles and whales); however, compliance can be challenging especially for those taking up the sport for the first time.

Lobsterman Dave Casoni (*left*) and Jeffrey Brodeur of Woods Hole Sea Grant (*right*) give step by step instructions in our new videos.

Our new eight-part instructional video series, filmed in Sandwich near the Cape Cod Canal, is designed to promote responsible practices and increase retention of recreational lobstering participants. Featuring professional lobsterman Dave Casoni of the Massachusetts Lobstermen's Association and Jeffery Brodeur of the Woods Hole Sea Grant Program, these videos provide a hands-on approach to lobster trap fishing. The project was funded by the NOAA Marine Debris Program and the National Fish and Wildlife Foundation.

At this winter's trade shows, including the New England Boat Show in Boston, *MarineFisheries* staff will be on hand to answer questions and promote the sports of recreational finfishing and lobstering. All permit holders this year will receive instructions on how to find our newest educational materials focusing on recreational lobstering—both written and the new videos. Check out the videos on the Division's YouTube page: https://www.youtube.com/user/massmarinefisheries.

By Dan McKiernan, Deputy Director

Confronting Two Rare Toxin Outbreaks Simultaneously

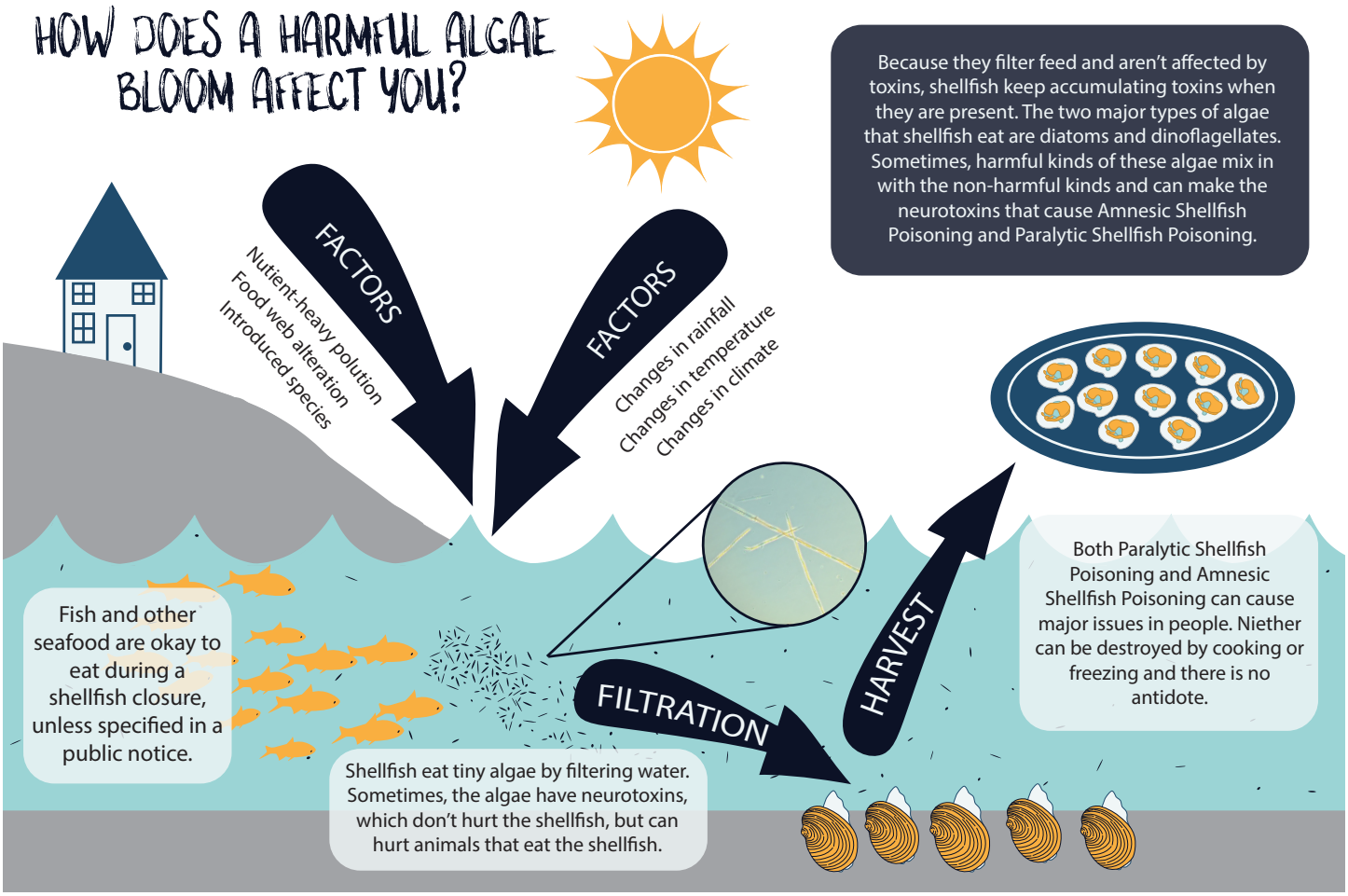
This past fall, *MarineFisheries* met the challenges of two rare events: an unprecedented toxic algae bloom in the state's south coastal waters and a norovirus outbreak in Wellfleet Harbor. Both events led to local closures of shellfish harvesting areas and in Wellfleet a recall of shellfish product. While this sort of unanticipated contamination is problematic for harvesters and shellfish connoisseurs, the Division's Shellfish Program staff's quick response and dedicated monitoring ensured that larger public safety issues did not unfold. Both areas have been reopened for harvesting and the shellfish is safe for consumption. No illnesses have been reported since either reopening.

South Coast ASP Closure

The *MarineFisheries* Shellfish Program monitors water quality throughout the Commonwealth's coastal waters for toxic algae and bacterial fluctuations that could affect the safety of our active shellfish beds. We have a robust protocol set in place for Red Tide blooms, should they occur. When Maine and then Rhode Island both reported massive blooms of *Pseudo-nitzschia*, *MarineFisheries* saw a possible disaster unfolding.

The scale of this bloom was a first of its kind in the Northeast, but for decades the US west coast has been dealing with the public health threat and economic losses due to *Pseudo-nitzschia* blooms. We didn't want the potential fallout of illnesses and lost income, due to product recalls, that something like Amnesic Shellfish Poisoning could cause. Between our Division staff, other state specialists, private researchers, and health officials from both state and federal agencies, countless hours were spent figuring out this massive problem.

Pseudo-nitzschia is a genus of specialized microalgae that is fairly prevalent in the ocean and belongs to a group of phytoplankton called diatoms. Of the 16 species found in the Gulf of Maine, nine of them produce some level of the toxin Domoic Acid, which causes Amnesic Shellfish Poisoning (ASP). As the name suggests, one of the symptoms is losing short-term memory. Other symptoms include



vomiting, diarrhea, abdominal cramps, headaches, and dizziness lasting for several days. High levels of Domoic Acid can cause permanent neurological damage and even death.

In early October it became clear that Maine, Rhode Island, and Massachusetts all had unprecedented and potentially devastating blooms occurring. Our shellfish team jumped into action. Two days after the initial reporting from Rhode Island, we began shutting down Massachusetts' south coast and southern Cape Cod and islands shellfish areas. Within the state, we partnered with Woods Hole Oceanographic Institution and University of Massachusetts Dartmouth's School for Marine Science and Technology (SMAST). Dr. Chrissy Petitpas, a phytoplankton expert at SMAST, worked continuously with our staff to track the bloom. We are fortunate to have her as *MarineFisheries* staff now, as an aquaculture and shellfish specialist. We also had assistance from Rhode Island, New Hampshire, Maine, and Florida resource agencies; the National Oceanic and Atmospheric Administration and federal Food and Drug Administration; and Bigelow Laboratory for Ocean Science from Maine. With help from these partners, we had continued monitoring throughout October and into early November. By October 27, the threat had dissipated and the closed shellfish beds were reopened to harvest on October 31. *Pseudo-nitzschia* counts were lower and lower in the affected areas and all shellfish meat sampled consistently tested negative for Domoic Acid.

Why was this event such a challenge? Besides having never dealt with this specific kind of bloom before, monitoring for *Pseudo-nitzschia*—and any associated toxins—is a difficult task. While it's relatively simple to monitor for *Pseudo-nitzschia*, there are many species within this genus and not all of them produce toxins. That means that high cell counts don't necessarily mean Domoic Acid or any other toxin is being produced. Even identifying the toxic species from the non-toxic species is a handful; there are only a few experts in the country who can do it. Lastly, while we can easily detect the presence of toxin with inexpensive methods, the tests to calculate the actual toxin levels require sophisticated and expensive equipment, and specialized technicians trained to run the equipment and read the results—none of which *MarineFisheries* has. Because of these roadblocks, we are extremely grateful for the cooperation and help given by all of the state and federal agencies, and private labs. Because of *MarineFisheries*' rapid response to the initial reports of a *Pseudo-nitzschia* bloom, and all of the help we have received, Massachusetts and other states have prevented a potentially devastating public safety issue. To this date, no illnesses related to Domoic Acid or Amnesic Shellfish Poisoning have been reported.

Looking ahead, the New England states have scheduled meetings with other biotoxin experts to explore strategies for dealing with future toxic *Pseudo-nitzschia* blooms through the Northeast Shellfish Sanitation Association and other venues. Nationally, the Interstate Shellfish Sanitation Conference has also become concerned and is planning to convene a biotoxin workshop this spring. These coordinated efforts will enhance how *MarineFisheries*—and our neighbors in the Northeast—respond to and manage future blooms of *Pseudo-nitzschia*.

Wellfleet Norovirus Outbreak

Also this October, *MarineFisheries* closed all waters for about a month within Wellfleet Harbor to harvesting of most shellfish species after an unusual outbreak of illnesses from shellfish harvested in the area. State and local public health officials confirmed the cause was norovirus, a highly contagious virus causing inflammation of the stomach or intestines, after 75 suspect cases were reported. This event came at a most inopportune time, just days before the renowned Wellfleet OysterFest. Local officials and event organizers

decided to continue with the event but did not serve any raw shellfish at the festival. The event's annual shucking contest was held but with oysters sourced from open shellfish areas outside Wellfleet.

Because all of the shellfish prepared to be sold at the festival was raised by oyster farmers, these growers faced the potential for significant income losses. *MarineFisheries* worked diligently to assist the farmers to get some of their shellfish back for replanting. Shellfish that were still in the possession of the first buyer and not co-mingled with other product were allowed to be returned to their aquaculture lease site. With help from *MarineFisheries* staff, along with state Department of Public Health and Wellfleet Shellfish Department officials, growers were able to replant 165,000 oysters and 50,000 quahogs. These shellfish could be harvested again later in the year when the threat of norovirus had passed and the waters were considered safe.

With the assistance of the local Board of Health, Shellfish Constable, and Harbormaster, *MarineFisheries* staff investigated the source of norovirus that caused the outbreak, and whether there was an ongoing source of contamination. We concluded that Wellfleet has excellent water quality and the illness outbreak was likely the result of a discrete transient introduction of norovirus into the waters of Wellfleet Harbor, possibly by overboard discharge. There are no indications of the presence of a re-occurring source of contamination. *MarineFisheries* met with industry representatives and local officials to discuss the situation and ways to prevent the introduction of contamination in the future.

Federal requirements mandate a minimum 21-day closure of a shellfish area if it is implicated in an illness outbreak consistent with a viral source. On November 14, *MarineFisheries*, in consultation with the US Food and Drug Administration, determined sufficient flushing had occurred to ensure that shellfish in the closed areas were safe for harvest and consumption. Areas were reopened for immediate harvest, with the exception of the re-planted shellfish which became available for harvest between November 27 and December 1, depending on the date of replanting. Importantly, there were no further reports of illness from the consumption of Wellfleet Harbor shellfish after the area was reopened.

Unfortunately, there was a substantial amount of shellfish already in commerce that had to be recalled and destroyed, representing a significant loss of income for harvesters and dealers. This amounted to 100,000 oysters and 63,000 quahogs. *MarineFisheries* is working with a number of Wellfleet organizations, nonprofit groups, and other stakeholders to support efforts for financial relief for impacted harvesters in Wellfleet.

By Mike Hickey, Shellfish Program Manager and Tom Shields, Senior Shellfish Biologist

Can Artificial Reefs Provide Shoreline Erosion Protection?

MarineFisheries *launches new study*

In the next decade, the Army Corps of Engineers will be widening and deepening parts of Boston Harbor for shipping traffic, resulting in the removal of up to 250,000 cubic yards of rock. The rock is thought to be a softer, shale material that can be extracted with a dredge, although some rock may require blasting. The default disposal plan for this rock is the Massachusetts Bay Disposal Site, one of three regional dredged material disposal sites off the coast of Massachusetts. It is a deep water site that receives material from such ports as Boston, Hingham, Salem, and Gloucester.

For many years, a multi-stakeholder working group, including *MarineFisheries*, has been considering other potential uses for this rock material. This past year we launched a project funded by the National Fish and Wildlife Foundation's Hurricane Sandy Coastal Resiliency Grant Program, focused on siting and designing nearshore artificial reefs. The intent is to install reefs that could be used for shoreline protection as well as serve as productive biological habitat. This project also explored if the rock from the Boston Harbor dredging project could be used to build such reefs.

There are many questions concerning such a project. For example, will the dredge material have big enough rocks? Can it be put on a site with a barge? How big does a reef have to be to protect the shoreline? Will the reef cause downstream sediment starvation? Can a reef protect a newly transplanted eelgrass bed? What are the permitting requirements for this type of project? With the grant funding, *MarineFisheries* partnered with the Nature Conservancy, Northeastern University, the Massachusetts Office of Coastal Zone Management, the Army Corps of Engineers, and Applied Coastal Research and Engineering to answer some of these questions and determine where we might build a nearshore reef.

The initial step was to look for areas where shoreline protection was needed. The dredge material would be transported 22 miles to the default disposal site, so the project looked at potential sites within a 22-mile radius of Boston. Thirty-three potential sites were identified and eventually reduced down to two for actual reef design. Each potential reef site is coupled with a control site for studying reef impacts.

The first site is on the south side of Gallops Island in Boston Harbor, very close to the planned dredging activities. Gallops Island has historical sites of interest, but was closed to the public in 2000 due to the presence of asbestos-containing building debris. Combined with its eroding shoreline, this makes the site a suitable candidate for an artificial reef to provide shoreline protection so the hazardous material doesn't end up in the water. In addition, despite it being a relatively low-energy site, previous attempts to restore eelgrass here have failed due to wave action, which could possibly be diminished by an artificial reef. This summer, side-scan sonar, video, and diver surveys showed that the site has the right characteristics for using dredged rock to build a reef structure.

For the second site, we selected a location that would provide us with a contrast to the Boston Harbor site. These two different kinds of sites can help us better understand the range of benefits and constraints in using nearshore reefs for the purposes of shoreline protection. Devereux Beach in Marblehead is a higher-energy site with a different set of engineering requirements. Rocks dredged from Boston Harbor would not be suitable here because their small size will cause them to wash away quickly. Initial biological work at Devereux Beach identified a high density of lobsters, so we want to examine the seasonality of how the lobsters use the area before we attempt any modifications.

These two sites are currently undergoing conceptual design work to explore what nearshore reefs could accomplish in terms of shoreline protection. For example, can we achieve any shoreline protection if

the reef structures are completely subtidal? Due to the tidal range at the sites, modeling indicates that a reef structure would have to be above water at low tide in order to have any shoreline protection value. This information is critical to establishing the performance criteria for the proposed reef structure.

By Kathryn Ford, Habitat Program Manager

Map of the two potential artificial reef sites and control sites.

High-Tech River Herring Counting Stations Added in Harwich and Aquinnah

A primary responsibility of *MarineFisheries*' Diadromous Fish Biology and Management Project is to monitor sea-run fish populations in coastal rivers in Massachusetts. We have ongoing monitoring efforts for river herring, American eel, rainbow smelt, and American shad. A majority of effort goes to the river herring migrations, which occur in over 80 river systems and capture the public's attention with their arrival each spring. The project has been working in recent years to extend our coverage of electronic or video herring counting stations to all major coastal drainage areas. This past spring (2016), we installed a high-technology counting station on Cape Cod at the Herring River in Harwich and helped the Aquinnah Wampanoag tribe install a video counting station at the Herring Creek on Martha's Vineyard.

We were seeking to add a monitoring station on Cape Cod connecting to Nantucket Sound. The Herring River watershed in Harwich and Brewster has over 1,100 acres of spawning and nursery habitat and historically supported one of the largest herring runs in Massachusetts. The site was also a suitable candidate with a supporting cast of local partners and a volunteer herring count occurring at the upstream pond that had documented up to a quarter of a million herring passing annually since 2009. We installed a Smith-Root multi-tube electronic counter at Herring River on March 15. With the mild winter, herring arrived early to southern Massachusetts and were recorded passing during the first night. The location of the Herring River counter is at the Belles Neck Reservoir, conservation land popular for its wooded hiking trails and for observing herring pass through the fish ladder into the reservoir.

The first year of running a counting station always involves modifications and a learning curve. This has never been truer than our first year at Herring River. The counting apparatus was viewed by some as an impediment to herring passing and we received a flurry of calls from concerned citizens with many suggestions for improving the counter. *MarineFisheries* staff, in collaboration with the Town's Herring Warden crew and staff with Barnstable County, modified the counter to improve passage. We increased the counting tube number from 8 to 16, reduced the counter frame height to have it sit lower on the fish ladder's exit weir, and worked on improved daytime passage by darkening features of the counter. We also put a dry erase decal on the counter box to update the daily count each day as well as the seasonal tally. This feature brought positive feedback from the public who appreciated checking in on the run during daily walks at the reservoir. The Harwich counter had a 2016 seasonal total of over 344,000 fish. More modifications will be made prior to the spring 2017 deployment, including improved downstream passage for post-spawning adult river herring. Stop by this spring to see the herring and check out our new and improved counter!

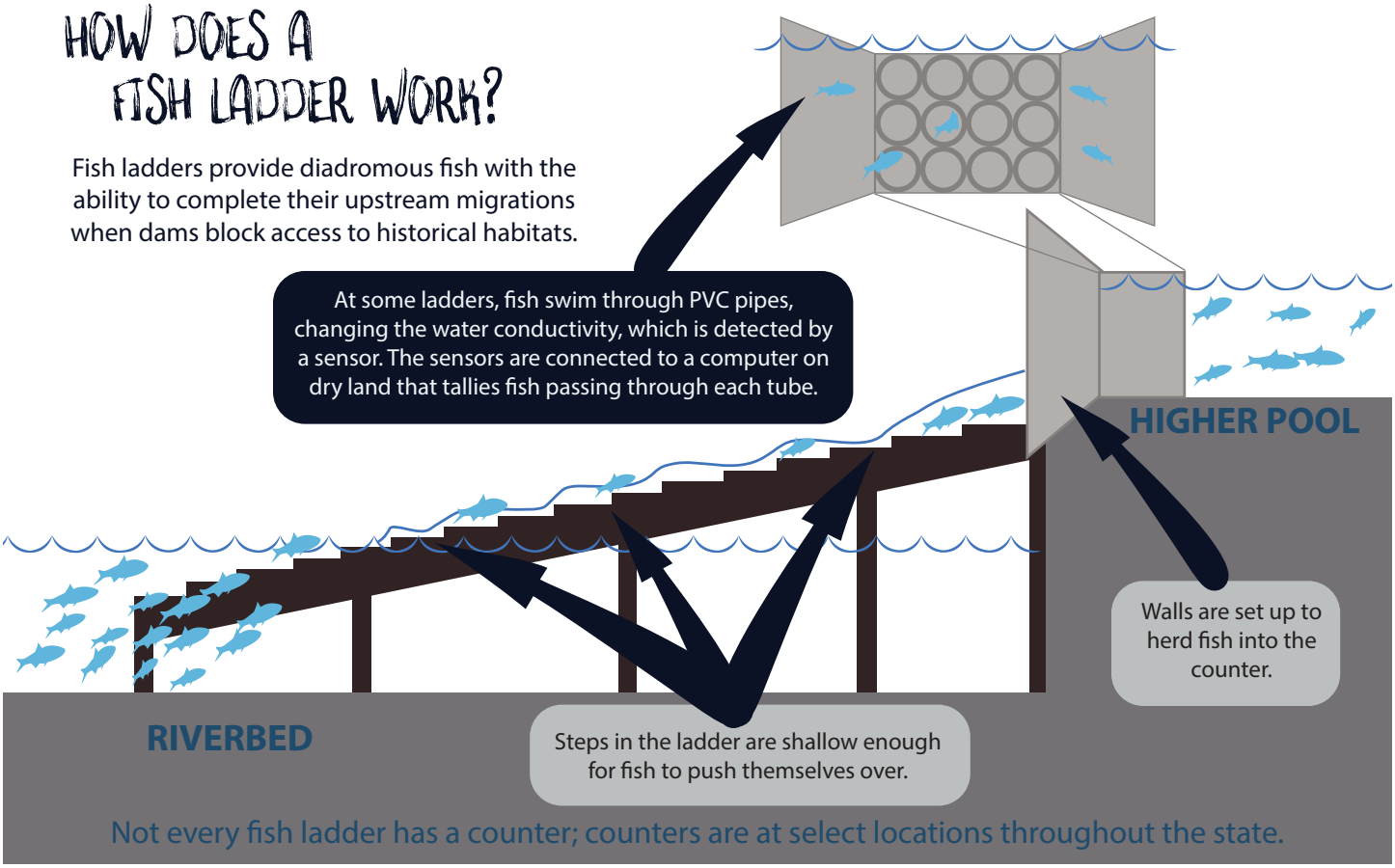
The Aquinnah video station also had herring passing through the first night after installation on March 23. Video stations offer the added feature of allowing the identification of different species. This station has documented diadromous American eel, white perch, and striped bass in addition to a growing tally of river herring and otters in pursuit of these sea-run fish. We are excited about the progress made with river herring monitoring in 2016 and thankful for the assistance of local partners and stewardship that works alongside these efforts.

By Sara Turner, Diadromous Fish Biologist and Bradford Chase, Diadromous Project Leader

River herring swimming through a electronic counter in Harwich.

HOW DOES A FISH LADDER WORK?

Fish ladders provide diadromous fish with the ability to complete their upstream migrations when dams block access to historical habitats.



Not every fish ladder has a counter; counters are at select locations throughout the state.

2017 Commercial Quota Outlook

Atlantic menhaden: 3,660,454 pounds (MA quota).
The 2017 coastwide commercial quota and Massachusetts' state-specific quota have been increased 6.5% compared to 2016. Of the ~440.9 million pound coastwide quota, Massachusetts receives 0.84%, making for an increase of about 222,000 pounds. The quota increase was a contentious issue facing the interstate management board this fall; some states supported no increase given other pending management changes and the forage fish role menhaden play in the environment, while other states favored a larger increase given the stock's healthy status, projected impacts of an increase, and market demand for more bait. In the end, a compromise was reached with the 6.5% increase.

Black sea bass: To be determined.
The 2017 coastwide commercial quota had been set—on an interim basis—at ~2.71 million pounds, the same as 2016. However, the 2016 benchmark stock assessment will provide the basis for revising the 2017 coastwide quota. Based on the advice of the Mid-Atlantic Fishery Management Council's Scientific and Statistical Committee, the Council and Atlantic States Marine Fisheries Commission are expected to select the coastwide quota in mid-February. Additionally, the National Marine Fisheries Service has announced the need to reduce the quota due to commercial catch in 2015 exceeding the annual catch limit largely because of higher than anticipated discards. The Council has initiated a management action to potentially revise this automatic Accountability Measure so that it considers stock status in determining the payback, an action which could be implemented and revise the reduction rate by mid-2017. Whatever the eventual coastwide quota is, Massachusetts will receive 13%.

Bluefish: 407,762 pounds (MA quota).
The 2017 coastwide commercial quota and Massachusetts' state-specific quota are up 24% in 2017. The coastwide quota is increasing from ~4.88 million pounds in 2016 to ~6.07 million pounds in 2017. With our state allocation of the coastwide quota at 6.7%, the increase adds about 80,000 pounds to the state's quota compared to 2016 (328,096 pounds). However, Massachusetts' final quota for 2016 was 553,096 pounds due to *MarineFisheries* acquiring quota transfers totaling 225,000 pounds from four states in order to keep the fishery open throughout the season of local availability. Our commercial fishery harvested 90% of the final 2016 quota or just under 500,000 pounds. *MarineFisheries* expects to seek quota transfers again in 2017 to avoid a premature quota closure.

Horseshoe crab: 165,000 crabs (MA quota).
Massachusetts' 2017 commercial quota for horseshoe crabs harvested for bait purposes is unchanged from 2016. Horseshoe crabs harvested for other purposes (i.e., biomedical use, research, display) are not counted against this quota.

Scup: 1,545,267 (MA Summer Period quota).
At ~18.38 million pounds, the 2017 coastwide commercial quota is down 10% from 2016. The Winter I Period (January–April) and Winter II Period (November–December) receive 45.11% and 15.94% of the coastwide quota, respectively; this equates to ~8.29 million pounds and ~2.93 million pounds for 2017. Quota during these periods is open to all states. Of the 38.95% (or ~7.16 million pounds for 2017) allocated to the Summer Period fishery (May–October), Massachusetts receives roughly 21.6%. Given prior year harvest

trends both coastwide and in Massachusetts, our scup fishery is unlikely to be constrained by the 2017 quota decrease.

Spiny dogfish: 22,677,836 pounds (ME–CT regional quota).
The coastwide commercial quota is decreasing just slightly (3%) from ~40.4 million pounds in Fishing Year 2016 to ~39.1 million pounds in FY 2017. (Spiny dogfish operates on a May 1–April 30 fishing year.) The Northern Region—Maine through Connecticut—receives 58% of the coastwide quota, of which Massachusetts generally takes the largest portion. Given prior year harvest trends for the Northern Region, the 2017 quota is not expected to limit Massachusetts' fishery.

Striped bass: 801,927 pounds (MA quota).
Massachusetts' base quota for 2017 is unchanged from 2016 (869,813 pounds). However, a roughly 8% quota overage in 2016 must be repaid pound-for-pound. There was no adjustment made to our 2016 quota from the base level, so the final quota for 2017 will be an effective 8% reduction.

Summer flounder (fluke): 385,988 pounds (MA quota).
The coastwide commercial quota has been set at an all-time low for 2017. The coastwide quota has been reduced 30%, to ~5.66 million pounds (down from ~8.12 million pounds in 2016) in order to end overfishing. Per the results of the 2016 stock assessment update, the stock was experiencing overfishing in 2014 and spawning biomass is trending downwards towards the biomass threshold, which if reached would trigger even more restrictive management. These results appear to be driven in part by low recruitment; the stock has experienced below-average year classes each year for the past six years (2010–2015). *MarineFisheries* considered modifications to the Commonwealth's commercial regulations, including soliciting public comment, but determined to make no changes. Based on prior year harvest trends, the summertime directed fishery beginning June 10 could close prior to the end of July. The Massachusetts quota reported above may need to be adjusted downward slightly to account for a prior year overage.

Tautog: 64,643 pounds (MA quota).
Despite no change to Massachusetts' base quota (64,753 pounds), the 2017 quota is an effective 11.5% increase from 2016. This is due to the 2016 quota having had to account for a 12% overage in 2015, while the 2017 quota only has to account for a 0.2% overage in 2016. The quota reported above may change slightly as 2016 landings data are finalized.

By Nichola Meserve, Fisheries Policy Analyst

SAFIS eDR/mobile with Swipe Card is LIVE!

New technology modernizes seafood transactions

MarineFisheries partnered in developing a new swipe card system that captures shellfish transactions in real time and is a streamlined alternative to existing reporting methods. As an added benefit, this new reporting method may result in a substantial reduction in paperwork for shellfish dealers and harvesters. This technology modernizes the data collection system while simultaneously improving accuracy and timeliness of reporting.

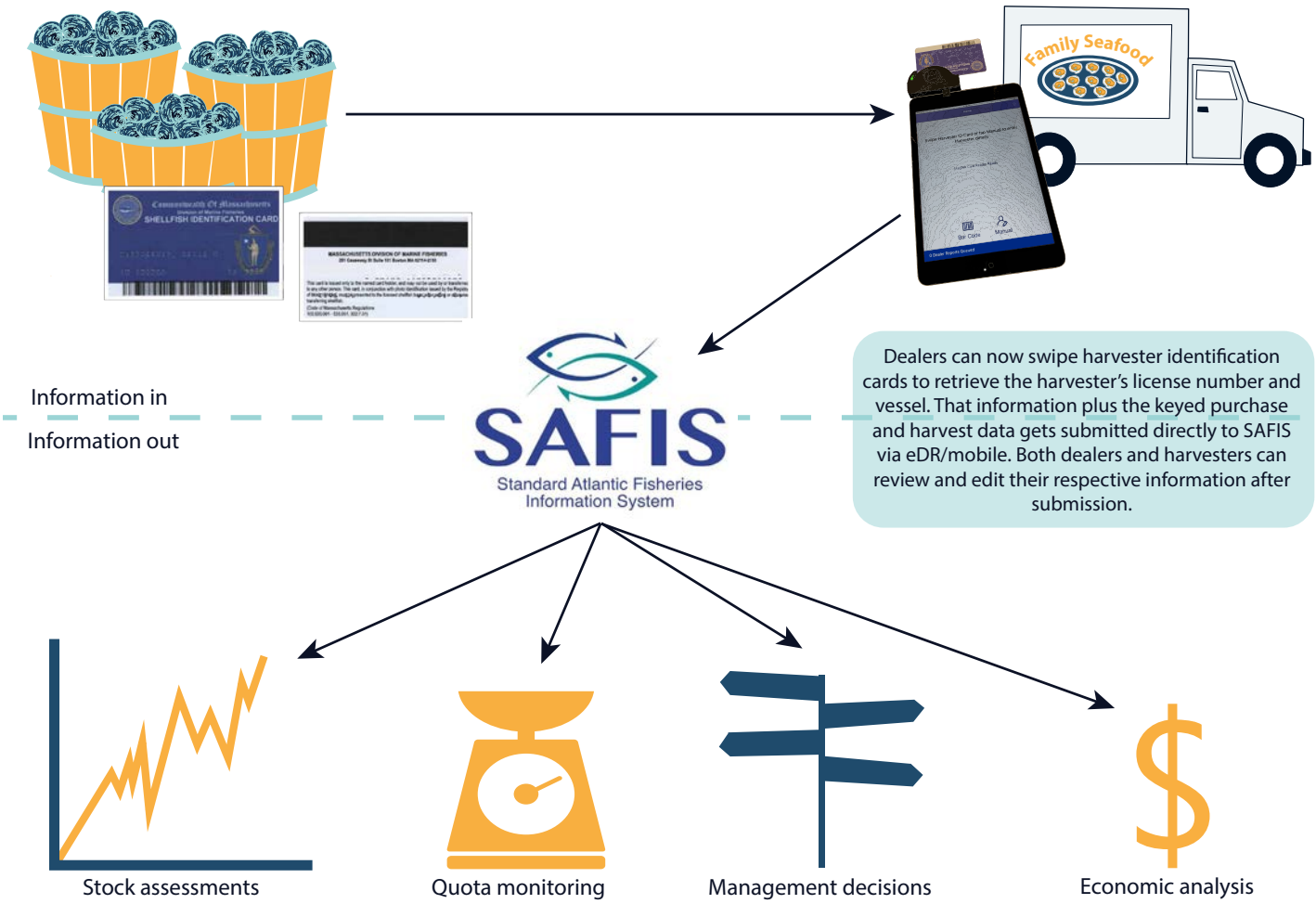
Fisheries-dependent Data Collection Background
The Division's Fisheries Statistics Project works collaboratively with the Atlantic Coastal Cooperative Statistics Program (ACCSP) and its 23 partners to establish and maintain fisheries-dependent data collection standards. Since 2005, Massachusetts has collected trip level data from dealers that include elements such as harvester, trip date, purchase date, vessel, species, quantity, and price. In 2010, mandatory trip level reporting went into effect for harvesters as well, which contain additional information regarding the effort for a specific trip including gear type and quantity, fishing time, and area fished. These data from Massachusetts and other states are housed by ACCSP in the Standard Atlantic Fisheries Information System (SAFIS), a database containing all dealer and harvester transactions. Applications of the data involve quota monitoring, stock assessments, management decisions, and economic analyses, among others.

In Massachusetts, both dealers and harvesters have the option of reporting via paper reports submitted to *MarineFisheries* or electronically via SAFIS web-based applications, namely eDR for dealers and eTRIPS for harvesters. Generally, if either a dealer or a harvester holds a federal permit, they are exempt from reporting to Massachusetts and instead report to the National Marine Fisheries Service. However, much of the federal dealer data is uploaded to the same SAFIS database thus streamlining the access to dealer data for both federal and state managers.

Swipe Card Pilot Project
MarineFisheries and the Maine Department of Natural Resources received funding in late 2014 to jointly develop a SAFIS mobile dealer reporting software that utilizes card-reading technology to begin and verify a transaction between a dealer and a harvester. In Massachusetts, the pilot project and initial release of the software application was engineered for state-reporting shellfish dealers. Shellfish harvesters had already been using Division-issued transaction cards in previous years that allow them to transport product to a dealer. These cards were modified to include a pre-determined data string in the magnetic stripe as well as in a barcode printed on the front of the card, both compatible with the new SAFIS mobile dealer software. This data string identifies the harvester's permit and year in which it is valid. The card is swiped through a card reader attached to the device using the application to initiate a transaction between a harvester and a dealer.

Harborlight Software was hired to develop the application in early 2015, and by the end of that year, *MarineFisheries* brought on three dealers to test the product and provide feedback that was incorporated into the development and testing process. Ultimately, this application was named SAFIS eDR/mobile with Swipe Card and went live in late summer 2016 for both Massachusetts and Maine.

eDR/mobile offers a point-of-sale transaction application that accommodates all required fields for Massachusetts shellfish dealers and offers a few expanded options over other electronic methods. First, the application is programmed to automatically display the vessel tied to the harvester's permit and only display those species a harvester is permitted to sell, eliminating any guesswork by the dealer. Second, the application allows a dealer to enter a few extra elements that will complete the harvester's trip report removing the need for the harvester to separately report that trip. If the harvester reports electronically, he can log into his eTRIPS account and see the resulting trip. Third, in recognition of the overlap in data reporting requirements for *MarineFisheries* and the Department of Public Health (DPH), a few data elements were added to accommodate the differences between the SAFIS report and the DPH receiving log. Dealers have the ability to download the data from SAFIS and add



a copy of their purchases directly to their DPH logs, thus reducing the need to copy the same information up to four times by hand into various logs. Fourth, the application will work offline and queue reports for submission once an internet connection is re-established. Lastly, the application lets the user email a receipt directly to the harvester and then print copies of a receipt if a combination card reader/printer is connected.

Project Summary and 2017 Production

Timeliness and accuracy of data submission have long been challenges for the Fisheries Statistics Project. The eDR/mobile application will help reduce the time lag between purchase and reporting, and connect the harvester and vessel to the transaction via his or her card, ultimately reducing staff time spent on auditing and generating more accurate data. eDR/mobile is available on Windows, iOS, and Android desktops, tablets, and phones at no cost. However, users must supply their own card readers of which there are four to choose from based on operating system. The readers range in cost from $45 to $100 for a card reader only, and are roughly $500 for a card reader/printer that will print receipts on site. Any state-reporting shellfish dealer is allowed and encouraged to use the application in 2017. An expanded version for additional fisheries will likely be available in 2018. For more information, please contact Anna Webb at 978-282-0308 x115 or anna.webb@state.ma.us.

By Anna Webb, Fisheries Statistics Project Manager

Monitoring American Shad in Small Coastal Rivers

In the spring of 2016, *MarineFisheries'* Diadromous Fisheries Project initiated an exploratory study to monitor the presence and abundance of American shad in the North River watershed. After a successful pilot year, the Division will continue monitoring efforts in order to improve the coastwide stock assessment and management for American shad.

American shad once constituted important commercial and recreational fisheries in Massachusetts. Declining numbers led to the prohibition of landing shad caught by nets in 1987, which effectively ended all commercial fisheries for this species in Massachusetts. Current regulations allow recreational harvest of shad (by hook and line only) in the two largest rivers—the Merrimack and Connecticut. Continued concern over the status of shad stocks in Massachusetts has limited recreational fishing to catch and release in all other rivers.

The coastwide stock assessment for American shad relies primarily on fisheries-dependent data collected from major coastal rivers where commercial fisheries occur. Through a collaborative effort between *MarineFisheries*, MassWildlife, and the US Fish and Wildlife Service, Massachusetts contributes to this assessment by conducting fish counts and collecting biological data from broodstock in the Connecticut and Merrimack Rivers. For the six smaller coastal rivers where shad still occur, the most recent information on these popu-

***MarineFisheries* biologist John Sheppard releasing an American shad.**

lations was collected by MassWildlife and *MarineFisheries* biologists in the late 1960s and early 1970s, in the form of catch information from recreational anglers.

MarineFisheries selected two of these smaller rivers, the South and Indianhead Rivers that historically supported important recreational fisheries for shad, to pilot additional monitoring efforts for shad beginning this past spring. With the assistance of MassWildlife biologist Steve Hurley and Southeast District Manager Jason Zimmer, research sites were identified in each river (from the head of tide to the first obstruction), and a combination of visual and stream electroshocking surveys were used to detect the presence of spawning adult shad and sample for biological data.

Throughout the course of 23 sampling trips made between April and June 2016, a total of 415 shad were observed in the two rivers, of which 174 were captured. Biological information, including age and genetic samples were collected from individual shad. Aging of scale samples indicated shad ranged between 3 and 9 years with some individuals having spawned up to four times previously. Indices of abundance were calculated for each river system which will be considered for utility in providing population metrics and trends for shad. The Division presented results at the New England Estuarine Research Society Fall meeting on Block Island, Rhode Island in October 2016.

Results from this first year of study successfully documented the presence of shad in the South and Indianhead Rivers. With a successful first year of study complete, *MarineFisheries* intends to continue monitoring for shad in these rivers in successive years to obtain long-term indices of population abundance for inclusion into the coastwide stock assessment. Future plans are in place to further refine the sampling protocols as well as to investigate the feasibility of expanding these efforts into other watersheds with a shad population, such as the Palmer River and the main stem of the Taunton River, in an effort to develop a more comprehensive monitoring program.

By John Sheppard, Diadromous Fisheries Biologist

Creature Feature—Sugar Kelp

Sugar kelp (*Saccharina latissima*) is a type of large edible marine macroalgae (seaweed) that is native to the cold, temperate waters of New England. It has a single leaf-like blade with characteristicly thick, frilly brown ribbons that resemble lasagna noodles. The common name *sugar kelp* comes from its distinct sweet taste caused by high concentrations of the sugar alcohol, mannitol. It is also known by the common names *sea-belt* and *Devil's apron*.

Like land plants, sugar kelp contains photosynthetic pigments, similar to chlorophyll, and uses energy from sunlight to produce food and oxygen from carbon dioxide and water. Sugar kelp usually grows as an annual species, meaning the natural life cycle produces a new harvestable generation each year. Sugar kelp is considered a winter crop with a growing season from late fall to spring, which allows it to take advantage of the increased available nitrogen and reduced competition during these colder months of the year. In general, kelp culture is considered ecologically beneficial due to its ability to uptake excess carbon and nutrients and provide structure for other marine organisms.

In order to grow kelp, mature kelp blades, known as sporophytes, are collected from the wild in the early fall and taken to a hatchery to be used as broodstock. Microscopic offspring are placed onto thin strings, where they develop into juvenile sporophytes. The tiny sporophytes are reared in the hatchery for about a month or until they reach between 1–2mm and are ready to leave the hatchery for the field. In the field, the seeded strings are wrapped around a horizontal line 6–10 feet below sea surface that is held in place by two anchored vertical lines. By spring, the kelp blades can reach over 12 feet in length and are ready for harvest.

Kelp aquaculture contributes to a seaweed industry that provides a wide variety of products (e.g., food, fertilizers, pharmaceuticals, cosmetics, and biofuel) estimated at a total annual value of $5.5–6 billion worldwide. However, most of the demand for cultured kelp is for human consumption, especially because the nutrient-rich seaweed is marketed as a "superfood." While the majority of seaweed harvest occurs in China, Korea, Japan, and Chile, market demand for edible seaweeds in North America is estimated at over $35 million and growing.

In Massachusetts, there is fledgling interest in kelp aquaculture. In 2016, *MarineFisheries* permitted a handful of shellfish aquaculturists in Buzzards Bay and Vineyard Sound to commercially grow kelp on existing shellfish aquaculture sites. Since 2012, *MarineFisheries* has issued scientific permits for a number of research efforts aimed at developing methods of nursery production and grow-out methods for kelp aquaculture in Massachusetts. These efforts are still in the pilot stage and there are many challenges associated with the development and management of a new aquaculture sector that requires further development before kelp aquaculture takes off across the Commonwealth and as a standalone crop.

One of the challenges associated with permitting kelp aquaculture in Massachusetts is assessing the risk associated with proposed kelp aquaculture gear and whale and turtle entanglement. Unlike the majority of existing Massachusetts shellfish aquaculture operations that are located in protected near shore waters, the siting requirements for kelp culture would typically place farms in waters of approximately 20–30 feet in depth. The depth of water and complexity of the gear has the potential to substantially increase interactions with protected species like whales and turtles. This presents a unique challenge in Massachusetts where upwards of 60% of the known North Atlantic right whale population returns to the waters surrounding Cape Cod Bay during the winter and spring to feed—coinciding with the kelp growing season. The horizontal lines used to suspend kelp in the water column are remarkably similar to other commercial fishing gear that has been banned from Cape Cod Bay waters during the annual whale congregation in an effort to reduce the occurrence of gear entanglements. *MarineFisheries* is working with researchers and industry members to understand if suspended and floating sub-tidal aquaculture gear represents as significant an entanglement risk as the gear types that are currently banned, but it may be some time before kelp aquaculture in Cape Cod Bay becomes a reality.

As the lead state agency in the Commonwealth tasked with reviewing aquaculture projects and working with local, state, and federal stakeholders to ensure aquaculture operations use the waters of the Commonwealth in a responsible and sustainable manner, *MarineFisheries* is working hard to address a number of concerns around the siting of projects and potential impacts related to navigation, protected resources, and the displacement of other user groups. An additional point of consideration for *MarineFisheries* and its partner agencies is ensuring the safety of seafood products harvested from Massachusetts waters. This is accomplished by requiring Massachusetts-grown kelp bound for human consumption to only come out of certified waters, and ensuring proper handling after harvest.

Kelp culture is not for those without sea legs and takes a significant amount of research and investment in order to brave the off-shore waters of Massachusetts in the winter and spring to successfully bring a kelp crop to market. There is much to be learned both on the operational side and management side of kelp aquaculture in Massachusetts and you can expect to see changes as the industry, managers, and current state of knowledge progress.

By Chrissy Petitpas and Chris Schillaci, Aquaculture Project Biologists

Sugar kelp is used in a variety of products like food, fertilizers, pharmaceuticals, cosmetics, and biofuel. (Photo courtesy of Martino's Seafood, LLC.)

Recent Publications

Bill Hoffman, **Micah Dean**, and **Nick Buchan** of the Division's Fisheries Dependent Investigation Project were on a team that estimated the discard mortality of Atlantic cod in the Gulf of Maine recreational rod-and-reel fishery. In the Gulf of Maine, recreational contributions to the total catch of cod have increased with recreational discards outnumbering recreational landings two-to-one. This study examined the capture-related factors most detrimental to cod survival. Atlantic cod caught with rod-and-reel were tagged with a pressure sensing tag and assessed for capture-related injuries prior to being returned to the ocean where an acoustic receiver array could monitor survival for up to 94 days. Results showed a greater incidence of mortality for cod moderately to severely injured by the capture and handling process. Accordingly, recreational rod-and-reel anglers should minimize fight and handling times, avoid areas with small cod, educate inexperienced anglers, and favor bait over jigs to mitigate mortality. Results will continue to inform the development of fishery management plans and enhance catch-and-release survival through dissemination of best practice techniques to fishery stakeholders. To read this paper in its entirety, find it on our Publications webpage as Contribution 64. The citation is: Capizzano, C. W., J. W. Mandelman, W. Hoffman, M. Dean, D. Zemeckis, H. Benoit, J. Kneebone, E. Jones, M. J. Stettner, N. Buchan, J. Langan, and J. Silukowski. 2016. **Estimating and mitigating the discard mortality of Atlantic cod (*Gadus morhua*) in the Gulf of Maine recreational rod-and-reel fishery**. *ICES Journal of Marine Science*. DOI: 10.1093/icesjms/fsw058.

Scott Elzey and **Kimberly Trull** published research on the aging of tautog using nonlethal methods. Historically, the operculum (bone protecting the gills) and otoliths (ear bone) have been used to age tautog, which has prevented researchers from collecting samples from fish that were to be released alive. In this study, Elzey and Trull compared the use of scales, dorsal-fin spines, pelvic-fin spines, opercula, whole sagittal otoliths, and sectioned sagittal otoliths as structures for age determination. Their results indicated that the pelvic-fin spines provide high precision age estimates without bias. This approach will allow researchers to easily gather more age-based data necessary for the successful management of tautog without having to sacrifice fish during sampling. The full paper can be found on our Publications webpage as Contribution 66. The citation is: Elzey, S. P. and K. J. Trull. 2016. **Identification of a nonlethal method for aging tautog (*Tautoga onitis*).** *Fishery Bulletin*. 114(4): 377-385. DOI: 10.7755/FB.114.4.1 .

Mike Pol, with researchers from SMAST, SINTEF Fisheries and Aquaculture (Norway), and the University of Tromsø (Norway), determined the selectivity and retention of Acadian redfish in a Gulf of Maine trawl fishery. Size selectivity is controlled by the mesh size of the codend, the part of the trawl where fish are retained. Three sizes of mesh opening were tested using a commercial fishing vessel conducting tows off Provincetown, Massachusetts. Using data from the tows, models for the mean length of 50% retention and selection ranges were developed for all three tested mesh sizes. Results from this study can be used to guide fishery managers, stock assessment scientists, and fishermen on size-dependent retention of Acadian redfish by codend mesh size. The entire study can be found on our Publications webpage as Contribution 67. The citation for this paper is: Pol, M., B. Herrmann, C. Rillahan, and P. He. 2016. **Impact of codend mesh sizes on selectivity and retention of Acadian redfish *Sebastes fasciatus* in the Gulf of Maine trawl fishery**. **Fisheries Research**. DOI: 10.1016/j.fishres.2016.06/013.

Mike Pol was on a team, including researchers from the Gulf of Maine Research Institute and a collaborating fisherman, testing a

topless trawl to avoid Atlantic cod while fishing for other stocks of groundfish. The low quotas for Atlantic cod restrict the ability for trawl fishermen to catch other abundant groundfish stocks. Fishermen in the region would benefit from modified trawls that can avoid cod, but still catch other groundfish species. Previous studies using topless trawls (i.e., trawls with a headrope more than 20% longer than the footrope) in this region showed reductions of cod, but also reductions in species of groundfish. This study tested a topless trawl on a commercial vessel with a greater headrope to footrope ratio and a greater flotation. Results show a 51% reduction in the catch of cod, with no significant loss of any other targeted groundfish species, suggesting this topless trawl can be an effective method for cod avoidance. The full paper can be found on our Publications webpage as Contribution 68. The citation is: Eayrs, S., M. Pol, S. Tallack Caporossi, and C. Bouchard. 2017. **Avoidance of Atlantic cod (*Gadus morhua*) with a topless trawl in the New England groundfish fishery**. Fisheries Research. 185, 145–152. DOI: 10.1016/j.fishres.2016.9.014.

Greg DeCelles, with a team of researchers, recently published a study proposing an eco-evolutionary perspective of reproductive resilience to understanding connectivity and productivity in marine fish. Reproductive resilience is the capacity of a population to maintain the reproductive success needed to result in long-term population stability despite disturbances. The team of researchers reviewed spawner recruitment systems models and their underlying assumptions about reproductive success to provide practical guidelines for integrating reproductive resilience into assessments of population connectivity and stock productivity. The entire paper can be found on our Publications page as Contribution 69. The citation is: Lowerre-Barbieri, S., G. DeCelles, P. Pepin, I. A. Catalán, B. Muhling, B. Erisman, et al. 2016. **Reproductive resilience: a paradigm shift in understanding spawner-recruit systems in exploited marine fish.** *FISH and FISHERIES*. DOI: 10.1111/faf/12180.

Accolades

In July 2016, two Division employees were awarded the Department of Fish and Game Performance Recognition Program Citation Award.

Melanie Griffin, Fisheries Management Specialist, has led the Division's successful administration of the Commercial Fisheries Revolving Loan Fund and the Groundfish Disaster Economic Assistance Program. The Commercial Fisheries Revolving Loan Fund is a $1 million program designed to preserve fishing opportunities for small-scale fishermen struggling through catch share management of groundfish fisheries. Since inception, Melanie has worked closely with commercial fishermen to continuously re-align the program to fit the dynamic conditions in the groundfish fishery. Through the Groundfish Disaster Economic Assistance Program, Melanie disbursed a total of $21.7 million in direct assistance to active groundfishermen, including commercial and for-hire permit holders and crew members, and shore-side businesses, plus other assistance strategies. These funds enabled the groundfish industry and communities to better cope with the ongoing New England fishery disaster declared by the Secretary of Commerce in 2012.

Melanie Griffin (*center)* with Department of Fish and Game Commissioner, George Peterson, Jr. (*left*), and Division of Marine Fisheries Director, David Pierce (*right*).

Mark Rousseau, Environmental Analyst, received the award for his completion of a 10-year effort to build an artificial reef in Nantucket Sound to benefit fish populations and recreational anglers (See *DMF News* 1st and 2nd Quarter). The Harwich Reef project was initiated by Mark and the Town of Harwich in 2006, and was supported by significant public interest in developing a recreational fishing destination for the town. Over the next several years, Mark worked diligently to secure the location, permits, materials, and funding for the project. The reef is so locally popular, that a fundraiser was held to ensure the development of a science curriculum about the reef for a local high school.

Mark Rousseau (*center)* with Department of Fish and Game Commissioner, George Peterson, Jr. (*left*), and Division of Marine Fisheries Director, David Pierce (*right*).

Divison Comings and Goings

Stock assessment specialist **Dr. Mike Bednarski** left the agency in September to pursue a career with the Virginia Department of Game and Inland Fisheries. Since 2014, Mike was the Division's lead on black sea bass, scup, fluke, and tautog, and served on multiple interstate technical committees. He originally joined *MarineFisheries* in 2012 as a member of the diadromous fish program. In his new role, Mike will serve as the Deputy Director of Aquatic Science and Policy within the Bureau of Wildlife Resources where he is stationed in Richmond, Virginia. He now oversees the operations of the Aquatic Science Program, which manages sport fish and non-game freshwater resources throughout the state of Virginia. We would like to thank Mike for all of his contributions and the excellent job he did on behalf of *MarineFisheries*.

David Roach retired in December after 28 years with the Division's Shellfish Sanitation and Management Project in Gloucester. Following eight years as the Town of Westport Shellfish Constable, Dave joined *MarineFisheries* in 1988, working in the Newburyport office until moving to our Gloucester station in 2002. Throughout his career as a shellfish biologist, Dave studied flats from Hull to Salisbury and is best known for his thorough and innovative classification of the highly productive clam beds of Essex Bay and the Merrimack River. Dave was dedicated to maintaining and expanding shellfishing opportunities for Massachusetts fishermen, while at the same time protecting public health through the proper sanitary classification of Massachusetts waters. His experience and dedication will be missed by his colleagues as well as the industry. We wish him all the best in retirement.

Mike Trainor, of our New Bedford office, has been promoted to Assistant Marine Fisheries Biologist within the Invertebrate Fisheries Project. His primary duties consist of invertebrate sampling on commercial and for-hire vessels, managing temperature monitor deployment and data analysis, managing gear for the coastwide ventless trap survey, and acting as an assistant Chief Scientist on the resource assessment trawl surveys. Mike joined *MarineFisheries* in 2010 as a contracted seasonal employee on the same project. Prior to that, he received an undergraduate degree from Roger Williams University and spent a few months as a groundfish observer in Alaska before heading back east, where he worked on the Connecticut Long Island Sound Trawl Survey.

Nicole Ward started with *MarineFisheries* in 2015 as a seasonal contractor on the Diadromous Fisheries Project. This past October, she joined the Fisheries Dependent Investigation team as a Fisheries Sampler at the Gloucester office. Her new responsibilities include at-sea and portside sampling (lobster, striped bass, whiting, sea bass, dogfish, herring, and menhaden), and assisting with the industry-based cod survey, resource assessment trawl survey, acoustic telemetry, and discard mortality projects. Nicole received her bachelor's degree in marine biology from the University of New England in 2010 and then worked as a fisheries observer throughout New England for five years. During that time she also worked as a Dredged Material Inspector in New York and Puerto Rico.

Dr. Christian "Chrissy" Petitpas was recently hired as an Aquaculture and Shellfish Specialist, joining the Shellfish Program in *MarineFisheries*' New Bedford office. Her focus is on the management of the state's expanding mariculture industry. Chrissy had been working with the Habitat Program in New Bedford, assisting the Environmental Review team since July 2009. Chrissy received her undergraduate degree in biology and biochemistry from the University of Massachusetts Dartmouth and earned her PhD in marine resource science and management from the University of Massachusetts Dartmouth School for Marine Science and Technology (SMAST). Her graduate and post-doctoral research at SMAST focused on harmful algae, particularly the species responsible for Paralytic Shellfish Poisoning in the northeastern US. She also studied Cochlodinium, which is responsible for the rust tide phenomenon observed in state waters during late summer and early fall.

In November **Kevin Magowan** joined the Shellfish Program as the new Shellfish Systems Depuration Coordinator in Newburyport. In this position, he will be responsible for managing day-to-day operations of the Shellfish Purification Plant process area for research, depuration, and wet storage. His name may be familiar, as he has worked previously as a fish tech with *MarineFisheries* in both Gloucester and New Bedford. He will also be assisting in the review and evaluation of municipal Waste Water Treatment Plant performance for compliance with National Shellfish Sanitation Program conditional area management plans. Kevin comes to *MarineFisheries* from the Wrentham Developmental Center, where he ran the wastewater treatment facility. Kevin has also held positions with the Town of Mattapoisett Shellfish Department and was a contractor with Cape Cod Cooperative Extension. He received his bachelor's degree from Unity College in Maine and his master's degree from North Carolina State University.

Marine Fisheries Updates

Public hearings, regulations, and legislation

During the period of July 1, 2016–December 31, 2016, the following regulatory changes were enacted by the Division of Marine Fisheries (*MarineFisheries*) after public hearings and Marine Fishery Advisory Commission approval.

American Eels
MarineFisheries amended its American eel regulations consistent with changes to the interstate fishery management plan. These changes include: adopting a commercial quota and quota closure system; and clarifying that the recreational eel limit applies to possession of eels during harvest and not the general possession of eels that were lawfully acquired for personal or bait use. With regards to the commercial quota, under the interstate plan a coast-wide quota is currently being utilized. However, state-specific quotas may be triggered by coast-wide overages. If state-specific quotas are triggered, Massachusetts would be allocated a 2,000-pound annual commercial quota.

Aquaculture Reared Finfish
The harvest, possession, and sale of aquaculture reared finfish at sizes that do not conform to the state's wild caught minimum size for that species is now legal. All nonconforming aquaculture reared finfish must be labeled as *Aquaculture Reared* or *Farm Raised* with a bill of lading documenting the product originated at a permitted aquaculture facility.

Aquaculture Reared Shellfish
Similar to the finfish rule above, regulatory changes were made to allow the in-state harvest, possession, and sale of aquaculture reared shellfish at sizes that do not conform to the state's wild caught standards. Aquaculture reared oysters measuring 2½-inch shell length may now be sold in Massachusetts. Previously, aquaculture reared oysters that were smaller than the 3-inch shell length wild caught standard had to be sold out-of-state. *MarineFisheries* also established a 1½-inch longest diameter minimum size for aquaculture raised surf clams, and this product may be harvested, possessed, or sold into commerce both inside and outside of Massachusetts; surf clams that are wild caught in Massachusetts' waters are still subject to a 5-inch shell diameter standard. A similar allowance for the in-state sale of nonconforming aquaculture raised quahogs was not enacted. Aquaculturists remain authorized to harvest quahogs that measure $^{7}/_{8}$-inch hinge width; quahogs smaller than the 1-inch hinge width wild caught standard must be sold to a primary buyer that in turn sells the product out-of-state. All containers that hold aquaculture reared oysters, surf clams, and quahogs that do not comply with the state's wild caught minimum sizes for these species must have the terms *Aquaculture Reared* or *Farm Raised* on the shellfish identification tag.

Commercial Scup Limits
To encourage the utilization of the state's summertime (May–October) commercial scup quota, *MarineFisheries* liberalized the state's commercial scup limits beginning after Labor Day. During this period, commercial fishermen are no longer subject to closed fishing days and may possess and land up to 1,500 pounds per day or per trip, whichever period is longer.

MA/NH Sea Herring Spawning Closure
In 2016, the interstate fishery management plan for Atlantic sea herring was adjusted. The adjustment included changing the methodology used to determine when sea herring spawning closures would go into effect in order to better fit the closure to peak spawning activity. Based on this adjustment, *MarineFisheries* then amended the MA/NH Sea Herring Spawning Closure regulations to reflect this change in the closure projection methodology.

Mobile Gear Vessel Upgrades
Since the early 1990s, vessel upgrades for mobile gear fishermen were restricted by caps of 10% on length and horsepower and 20% on gross tonnage as compared to the vessel's baseline. Concurrent with changes to the federal rule, *MarineFisheries* eliminated the restriction on gross tonnage. Additionally, *MarineFisheries* eliminated the restriction on horsepower. This was done to reduce costs on fishermen and allow them to upgrade into more modern vessels. The restriction on vessel length was retained to maintain some controls over fleet capacity. However, the Director may now waive restriction on upgrades of total length if the new upgraded vessel does not exceed 50 feet.

Reorganization and Recodification
Under Executive Order 562 issued by Governor Baker, *MarineFisheries*' regulations were clarified, updated, merged, reorganized and rescinded to modernize and improve the regulatory code.

Sink Gillnets
The federal Atlantic Large Whale Take Reduction Plan regulates state and federal commercial fixed gear fisheries to protect against mortality and injury that may be caused by whales becoming entangled in fishing gear. A recent amendment to the federal rule adjusted endline marking requirements for gillnets. Consistent with this change, complementary state regulations now require that all gillnet fishermen mark the top, middle, and bottom of their endlines with a 12-inch green mark. If the endline is green rope, the mark may be white.

Surf Clam Management
In response to requests from the state's surf clam industry, *MarineFisheries* amended two longstanding surf clam regulations. First, a state-wide maximum surf clam dredge width of 48 inches was established; this rescinded the rule that allowed for the use of a 100-inch dredge south of Cape Cod. Second, surf clams that are legally harvested in jurisdictions outside of Massachusetts do not have to conform to the state's 5-inch minimum size to be possessed, landed, or sold in Massachusetts.

Trap Tag Allocations for Conch Pots
Due to high rates of gear loss in the conch pot fishery, requests for replacement trap tags are common. To address this, *MarineFisheries* increased the initial allocation of conch pot trap tags from 220 to 240. If additional trap tags are needed beyond this, a replacement set must be ordered and installed on all conch pot gear.

Whelk Management
Three new rules were adopted to better manage the state's channeled and knobbed whelk fishery. A 15-mixed whelk recreational limit was established; this limit now provides a threshold for when a commercial permit is needed. A two-fish tote limit of mixed whelk for commercial harvest by hand was established; this will accommodate existing levels of effort while restricting new opportunistic effort from targeting these increasingly depleted stocks. Lastly, to improve minimum size management, which is the cornerstone of the whelk conservation strategy, *MarineFisheries* refined the language describing how to measure whelks. Now, all whelks must be measured with their operculum lying as flat on the gauge as possible in an orientation where a straight line drawn from the shell's apex to its siphonal canal is parallel to the sides on the gauge.

Legal Notice of Public Hearings

Scheduled for February 2017

Under the provisions of M.G.L. c. 30A and pursuant to the authority found at M.G.L. c. 130 §§ 2, 17A, 17C, 21, 80 and 104, the Division of Marine Fisheries (DMF) and the Marine Fisheries Advisory Commission have scheduled public hearings and a public comment period to accept comment on draft regulatory proposals at 322 CMR 4.00, 6.00, and 7.00. Details regarding the public comment period and the public hearing schedule are provided at the end of this notice. A public hearing primer document will be published on DMF's website in advance of the hearings. The hearing proposals are as follows:

1. **Nantucket Mobile Gear Petition (322 CMR 4.06)**. Accept comments on a petition by Nantucket officials affecting mobile gear fishing around the island. This petition requests DMF adopt regulations that will enact:
   a. Mobile Gear Closures: Close all waters within three miles of the Nantucket archipelago to all mobile gear fishing (i.e., dredge and trawl), except for dredge gear used to harvest shellfish managed by the town (i.e., bay scallops and bay quahogs) during the period of May 1–October 31;
   b. Net Mesh Minimum Size in Squid Fishery: Establish a minimum mesh size of $1^{7}/_{8}$" for the squid trawl fishery, consistent with existing federal rules.

c. Prohibition on Use of Net Strengtheners: Prohibit the use of net strengtheners in the squid trawl fishery.

2. **Other Proposals Affecting Trawl Fisheries (322 CMR 4.06)**. This proposed amendment would affects:
a. Bycatch Allowance for Flounders in Squid Fishery: Refine the allowance for flounders during the small mesh trawl fishery so that it does not list prohibited species (e.g., windowpane flounder); and
b. Measurement of Large Net Meshes: Require net meshes in large mesh fisheries be measured with the pressure or pull of 8 kilograms to conform state rules to existing federal rules.

3. **Knobbed and Channeled Whelk Conservation and Management (322 CMR 6.12 and 6.21)**. This proposed amendment affects:
a. Minimum Size Management:
i. Require the use an unmodified chute gauge matching certain DMF prescribed dimensions to determine the effective minimum size of whelks;
ii. Amend the mandatory orientation of the whelk in the chute gauge for the purpose of measurement from a "parallel method" to an "any orientation method;"
iii. For 2017 and 2018, minimum size compliance will be determined by measuring whelks with a 3" wide chute gauge and "any orientation" method". This will result in an approximate 3/16" increase to the effective minimum size; and
iv. Increase the effective minimum size to 3 7/8" through five 1/8" increases and one 1/16" increase over 10 years through biennial adjustments that begin in 2019. These minimum size increases will correspond to gauge width adjustments that are to be specified by a Declaration of the Director prior to the start of the calendar year when the gauge width adjustment goes into effect.
b. Summertime Closure and Conch Pot Haul Out Period: From July 26–September 6:
i. Prohibit the retention and landing of whelks by all gear; and
ii. Require all conch pot gear be removed from the waters of the Commonwealth.

4. **Opening Individual River Herring Runs (322 CMR 6.17)**. This proposed regulation would provide DMF with the authority to open individual rivers to the harvest of river herring if they have an ASMFC approved sustainability management plan and specific permitting, harvest and identification requirements. The Nemasket River may be the first run to potentially open under this authority.

5. **Clarification on Commercial Striped Bass Limits (322 CMR 6.07)**. This proposed amendment would limit all shore-based commercial fishing activity to a 2-fish limit. The 15-fish commercial striped bass limit will apply only to the holders of vessel based permits while fishing from the vessel named on the permit.

6. **Commercial Witch Flounder Limits (322 CMR 6.03)**. This proposed amendment would reduce the state-waters commercial witch flounder trip limits from 1,000 pounds to potentially as low as 300 pounds to ensure state harvest remains within the federally allocated state-waters set-aside. This limit will apply to holders of the state Groundfish Endorsement and federal permit holders fishing in state-waters.

7. **Commercial Tautog Seasonal Quota Allocations (322 CMR 6.40)**. This proposed amendment would eliminate the commercial spring fishery for tautog. The entire annual commercial tautog quota will be moved to the fall fishery that begins on September 1.

8. **Commercial Black Sea Bass Management (322 CMR 6.12 and 6.27)**. This proposed amendment would:
a. Adjust the number and sequence of commercial fishing days for black sea bass to extend the length of the commercial fishing season;
b. Clarify that applicable commercial trip limits apply by permit endorsement type; and
c. Reduce the sea bass trap limit from 200 to 100 beginning in 2018.

9. **Commercial Scup Regulations (322 CMR 6.28)**. This proposed amendment would:
a. Establish a weekly 10,000 pound commercial scup limit for trawlers and eliminate closed days for trawlers fishing during the May 1–October 31 fishery; and
b. Eliminate closed fishing days for all other gears (e.g., hook and line and pots) from July 1 through October 31.

10. **Horseshoe Crab Rules for Mobile Gear (322 CMR 6.34)**. This proposed amendment would:
a. Increase the horseshoe crab mobile gear trip limits from 300 crabs to 600 crabs effective no later than July 1; and
b. Exempt mobile gear fishermen from all or some of the springtime lunar closures.

11. **Commercial Menhaden Trip Limit Trigger (322 CMR 6.43)**. This proposed amendment would liberalize the menhaden trip limit trigger by having the trip limit drop from 125,000 pounds to 25,000 pounds when 85% of the annual quota is taken. Currently trip limits are reduced from 125,000 pounds to 25,000 pounds when 75% of the annual quota is taken.

12. **Commercial Cancer Crab Limits for Gillnet and Trawl Gears (322 CMR 6.44)**. This proposed regulation would increase the by-catch allowance in non-trap gear from 200 crabs to 1,000 crabs per calendar day or per fishing trip, whichever is longer.

13. **Taking of Recreational Limits during Commercial Fishing Trips (322 CMR 6.41)**. This proposed amendment would either prohibit the taking of recreational catch during commercial fishing trips or provide nominal allowances for this activity subject to certain restrictions.

14. **Fish and Conch Pot Night Fishing Prohibition (322 CMR 6.12)**. This proposed regulation would prohibit the hauling or setting of fish or conch pot gear ½ hour after sunset to ½ hour before sunrise, similar to existing prohibitions on lobster and crab trap fishing.

15. **Artificial Structures Set to Catch Lobsters (322 CMR 6.02)**. This proposed regulation would prohibit commercial and recreational lobstermen from setting of non-trap structures (e.g., porcelain and cement containers) that are designed to attract lobsters and enhance their taking by scuba.

16. **Gillnet Highflyers (322 CMR 4.04)**. This proposed amendment would rescind the requirement that all sink gillnets surface buoys systems have a standard 12-inch tetrahedral corner radar reflector on one of the highflyers.

17. **Offshore Lobster Permit Transfers (322 CMR 7.06 and 7.08)**. This proposed regulation will establish transfer provisions and requirements for offshore lobster permit transfers.

18. **Bay Scallop Shucking Endorsement (322 CMR 7.01)**. This proposed amendment would correct the language establishing the bay scallop shucking endorsement to clarify that this permit endorsement authorizes shucking on only shore and not at-sea.

Instructions for Written Comments
Written public comments will be accepted until 5:00 p.m. on February 17, 2017. Please address all comments to Director David Pierce. Comments can be sent by e-mail to marine.fish@state.ma.us or by mail to 251 Causeway Street, Suite 400, Boston, MA 02114. To obtain a full copy of the draft regulations or the public hearing primer document, please visit our website or contact Jared Silva by phone (617-626-1534) or through e-mail (jared.silva@state.ma.us).

Public Hearing Schedule
Monday, February 6, 2017
6:00 p.m.
DMF Annisquam River Station, 30 Emerson Avenue, Gloucester, MA 01930

Wednesday, February 8, 2017
10:00 a.m.
Tisbury Town Hall Katharine Cornell Theater, 51 Spring Street, Tisbury, MA 02568

Wednesday, February 8, 2017
6:00 p.m.
MA Maritime Academy Admiral's Hall, 101 Academy Drive, Buzzards Bay, MA 02532

Monday, February 13, 2017
11:00 a.m.
Nantucket Police Station Meeting Room, 4 Fairgrounds Road, Nantucket, MA 02554

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