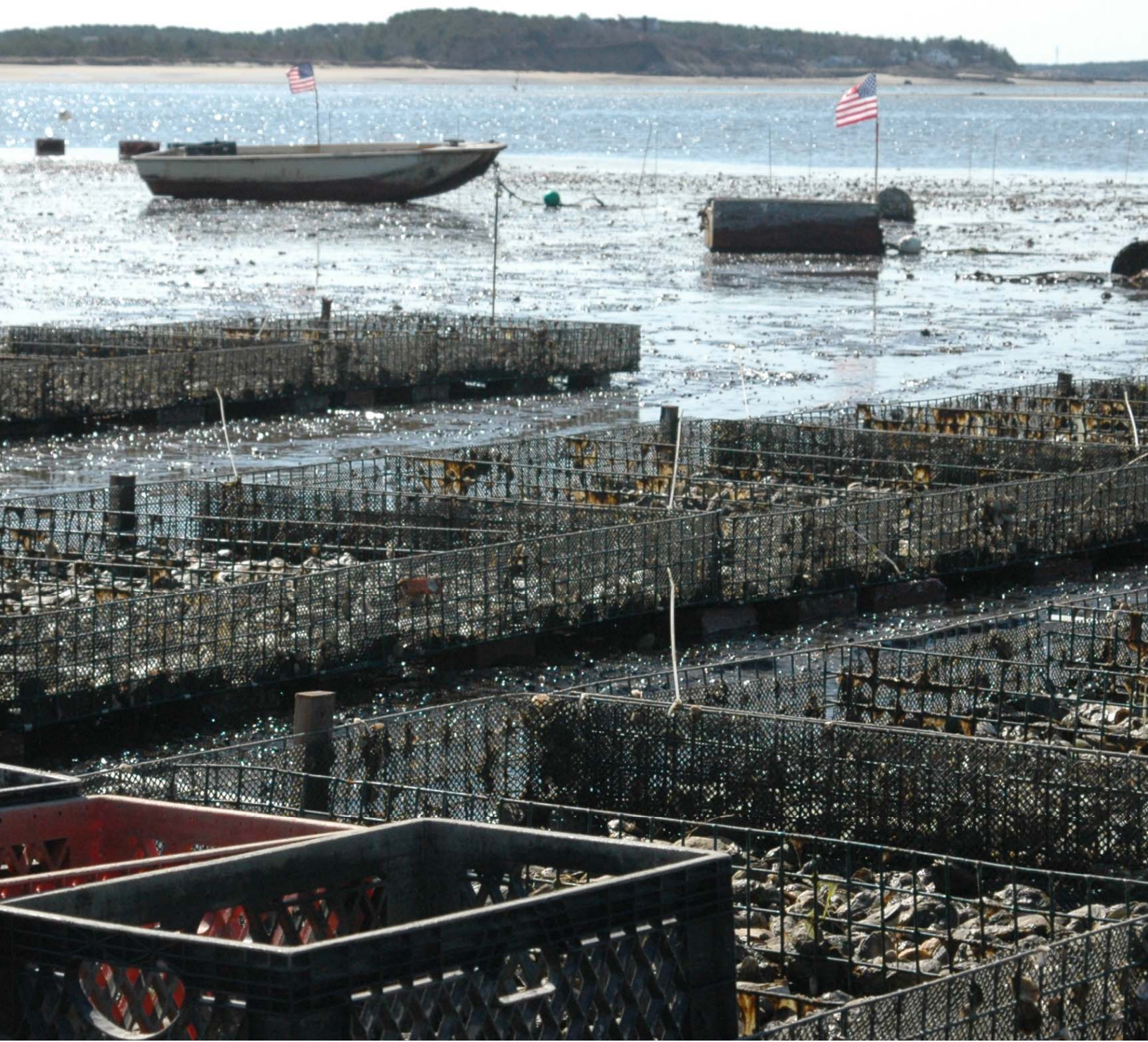


Department of Fish and Game

Massachusetts Marine Fisheries 2014 Annual Report



Department of Fish and Game

Massachusetts Division of Marine Fisheries

2014 Annual Report

Commonwealth of Massachusetts

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MarineFisheries
Commonwealth of Massachusetts



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Introduction

The Massachusetts Division of Marine Fisheries (*Marine Fisheries*) of the Department of Fish and Game is the Commonwealth's chief fisheries management agency. *Marine Fisheries* is responsible for the development and promulgation of the Commonwealth's regulations governing commercial and recreational fishing activity conducted in the marine environment. The Division promotes and develops commercial and recreational fisheries through research, technical assistance, and the collection of statistics. Guidelines for managing marine fisheries come through Chapter 130 of Massachusetts General Law, the Atlantic Coastal Fisheries Cooperative Management Act, the Interjurisdictional Fisheries Management Act, and the Magnuson-Stevens Fishery Conservation and Management Act.

To successfully fulfill its responsibilities, the Division has established the following mission, vision, and goals.

Mission

To manage the Commonwealth's living marine resources in balance with the environment resulting in sustainable fisheries and contributions to our economy, stable availability of diverse, healthy seafood and enriched opportunities that support our coastal culture.

Vision

Sustainable fisheries and a healthy marine ecosystem achieved through innovation, collaboration, and leadership enriching the public's way of life.

Goals

Improve fisheries sustainability, promote responsible harvest and optimize production of our living marine resources.

Promote and support our commercial and recreational fisheries.

Promote and support industry and community involvement in the fisheries management process.

Foster partnerships that help accomplish the Division's mission.

Support continued development of an ecologically sustainable marine aquaculture industry.

Promote a high level of staff commitment and professionalism.

Ensure that marine spatial planning activities are compatible with fisheries management.

Frequently Used Acronyms and Abbreviations

Army Corps	US Army Corps of Engineers
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACE	Annual Catch Entitlement
ACL	Annual Catch Limit
AM	Accountability Measure
ASMFC	Atlantic States Marine Fisheries Commission
CCB	Cape Cod Bay
CE	Conservation Engineering
DAS	Days-at-sea
EOEEA	Executive Office of Energy and Environmental Affairs
EPA	United States Environmental Protection Agency
FMP	Fishery Management Plan
GIS	Geospatial Information System
ILF	In-lieu Fee
ISSC	Interstate Shellfish Sanitation Conference
LMA	Lobster Management Area
<i>MassDAR</i>	Massachusetts Department of Agricultural Resources
<i>MassDCR</i>	Massachusetts Department of Conservation and Recreation
<i>MassDEP</i>	Massachusetts Department of Environmental Protection
<i>MassDFG</i>	Massachusetts Department of Fish and Game
<i>MassDOT</i>	Massachusetts Department of Transportation
<i>MassDPH</i>	Massachusetts Department of Public Health
Massport	Massachusetts Port Authority
<i>MassWildlife</i>	Massachusetts Division of Fisheries and Wildlife
MAFMC	Mid-Atlantic Fishery Management Council
MFAC	Marine Fisheries Advisory Commission
MRIP	Marine Recreational Information Program
NEFMC	New England Fishery Management Council
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NSSP	National Shellfish Sanitation Program
OLE	Office of Law Enforcement (Massachusetts)
PCCS	Provincetown Center for Coastal Studies
PDT	Plan Development Team
PSP	Paralytic Shellfish Poisoning
SAFIS	Standard Atlantic Fisheries Information System
SMASST	School for Marine Science and Technology (at UMass Dartmouth)
SNE	Southern New England
TAC	Total Allowable Catch
USCG	United States Coast Guard
USFDA	United States Food and Drug Administration
USFWS	United States Fish and Wildlife Service
VTR	Vessel Trip Report
YOY	Young-of-year

FISHERIES MANAGEMENT AND POLICY SECTION

Policy and Fisheries Management Program

Personnel

Paul Diodati, Director
Dr. David Pierce, Deputy Director
Daniel McKiernan, Deputy Director
Steve Correia, Senior Marine Fisheries Biologist
Melanie Griffin, Fisheries Management Specialist
Nichola Meserve, Fisheries Policy Analyst
Story Reed, Permit Program Administrator
Jared Silva, Regulatory Coordinator
Samantha Andrews, Contracted Economic Fishery Assistance Specialist

Conservation Engineering Project

Michael Pol, Project Leader
David Chosid, Marine Fisheries Biologist
Mark Szymanski, Assistant Marine Fisheries Biologist

Overview

Marine Fisheries is responsible for managing the Commonwealth's commercial and recreational fisheries. Management of marine resources unique to state waters and which cross state/federal boundaries is a constant, ongoing endeavor. A core of fisheries management professionals, with many years of practical experience and knowledge of Massachusetts fisheries, composes the team that initiates, evaluates, and selects fisheries management policy and strategies to implement rules and regulations. These rules and regulations frequently result from participation on, and in support of, federal fisheries management through the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC), and interstate fisheries management through the Atlantic States Marine Fisheries Commission (ASMFC).

Our fisheries policy and management staff gathers and analyzes biological and economic data, communicates with the media and public on state, interstate, and federal fisheries management issues, and ensures adherence to administrative and regulatory protocols and procedures. This process also relies on our technical staff to provide biological analyses and other technical reviews of management options to ensure sustainable fisheries and fisheries habitat protection.

Frequent communications with commercial and recreational fishery participants is another important element of policy and management development. This effort directly involves a diverse array of fishermen, dealers, processors, and many other stakeholders. Public hearings to propose regulation changes are held by the Commonwealth's Marine Fisheries Advisory Commission (MFAC) established by the Legislature in 1961. The MFAC and the Commissioner of the Department of Fish and Game must approve regulatory changes that *Marine Fisheries* proposes in order for them to be implemented.

Advisory Groups

Following below is a summary of 2014 proceedings by groups advising *Marine Fisheries* on fishery management issues.

Marine Fisheries Advisory Commission

The MFAC held seven business meetings during 2014. The membership of the MFAC changed in 2014 with the addition of Chatham-based commercial fisherman and seafood dealer, Domenic Santoro. Mr. Santoro filled the seat previously held by John Pappalardo.

The following regulatory revisions became effective in 2014 with the approval of the MFAC: elimination of the exemption for federal groundfish permit holders to harvest above the state's winter flounder trip limit when in state waters (322 CMR 6.03 (12)); a ban on the possession and sale of three species of Asian horseshoe crabs (322 CMR 6.34(12)); extension of the season for the small mesh squid fishery south of Martha's Vineyard and Nantucket (322 CMR 8.07 (1)(b)(i)); a merger of the state's commercial and recreational bluefish regulations into one section (322 CMR 6.18); amendments to the fish pot permitting, tagging, and setting rules, including an owner-operator requirement and haul-out periods (322 CMR 6.12, 6.31 and 7.06); implementation of a mixed whelk trip limit and lowering of the horseshoe crab trip limit for trawl gear and increase of the knobbed whelk minimum size (322 CMR 6.21 and 6.34); amendments to the commercial striped bass harvester, dealer, and permitting regulations, including modified days and trip limits, a control date, and a tagging program (322 CMR 6.07 and 7.04); adoption of several conservation measures for American eel, including a size limit increase, recreational bag limit decrease, and minimum mesh requirements (322 CMR 6.30); application of the tautog minimum size to all persons (322 CMR 6.40); establishment of a uniform v-notch lobster possession standard for the recreational fishery (322 CMR 6.02(3)(e)); increase in the recreational minimum size limit for hammerhead sharks (322 CMR 6.37(3)(a)); codification of the process for closing quota managed fisheries (322 CMR 6.41(2)(c)); establishment of specification and quota closure processes for Atlantic herring (322 CMR 9.05); lengthening of the Southern New England winter flounder recreational season (322 CMR 6.03(11)); establishment of several rules to improve recreational fishing compliance with regards to violations aboard for-hire vessels, at-sea filleting, and comingled recreational harvest (322 CMR 6.41(3)); an allowance to carry an electronic recreational fishing license rather than a hard copy (322 CMR 7.01(5)(g)); adoption of shellfish regulations relevant to tagging and handling, and to implement the 2014 Vibrio Control Plan (322 CMR 16); and revisions to the recreational black sea bass season and bag limit (322 CMR 6.28(5)). The MFAC also approved commercial fishery annual specifications and/or mid-season adjustments for spiny dogfish trip limits, Atlantic herring days out, scup trip limits and open days, and northern shrimp.

Marine Fisheries and the MFAC conducted a total of seven public hearings in 2014 on proposed revisions to the Commonwealth's marine fishery regulations at 322 CMR. The Division also held one hearing on behalf of the Executive Office of Administration and Finance regarding lobster permit fees, conducted one public meeting regarding vibrio management, and hosted seven public hearings for the ASMFC on the interstate management of spiny dogfish, striped bass, Jonah crab, and summer flounder.

Marine Recreational Fisheries Development Panel

Pursuant to provisions of “An Act Instituting Saltwater Fishing Licenses”, a Marine Recreational Fisheries Development Panel was established in 2010 to recommend how annual appropriations from the Marine Recreational Fisheries Development Fund should be spent. All fees collected from the sale of recreational saltwater fishing permits are deposited into this fund for the dedicated purpose of improving recreational fisheries or recreational fishery research in the Commonwealth, with a requirement that one-third of the annual appropriation be used for “improved public access to marine recreational fisheries.”

The Panel met during June 2014 to make recommendations for spending of the expected FY15 fund appropriation of roughly \$1.3 million. The approved spending plan included, but was not limited to: improvement and enlargement of the fishing pier at Cashman Park in Newburyport; continuation of a Small Grants Program through which municipalities can compete for funds to finance small public access improvement projects within their jurisdictions; design work for possible future fishing pier construction in various locations; continuation of expanded and enhanced sampling and assessment of the recreational fishery; public informational and educational materials and programs; stocking and monitoring diadromous fish populations; and monitoring fish populations at artificial reefs.

The Panel was also in attendance for the June 19 ribbon-cutting event for the new Oak Bluffs Fishing Pier on Martha’s Vineyard ([Figure 1](#)). Construction of this wooden, 320-foot, L-shaped, handicapped-accessible fishing pier was financed, in part, by monies from the Marine Recreational Fisheries Development Fund; other funding was provided by the U.S. Fish & Wildlife Service’s Sport Fish Restoration Program and the Department of Fish & Game.



Figure 1. Federal, state, and town officials and many members of the recreational fishing community braved the rain during the Oak Bluffs Pier ribbon-cutting event.

Seafood Marketing Steering Committee

On August 13, Governor Patrick signed into law “An Act Promoting Economic Growth Across the Commonwealth,” which, in part, established a Seafood Marketing Program within *MarineFisheries*. This establishment of this program is a direct result of the recommendation made by a special commission on seafood marketing, tasked by the legislature to investigate the merits of developing a Massachusetts seafood marketing program, as well as Senate Bill 1979, “An Act Establishing a Massachusetts Seafood Marketing Program,” filed by Senator Bruce Tarr in 2013. The legislation lays out initial objectives of the program (e.g., creating name recognition for the Commonwealth’s seafood products) and requires the appointment of a 19-member steering committee to guide *MarineFisheries* in the administration of the marketing program. The Marketing Program is to be funded by up to \$250,000 per fiscal year from commercial harvester and dealer permit revenues. It was expected that the steering committee would be appointed in 2015 and initial funding for the program would become available in fiscal year 2016. *MarineFisheries* expected to hire a coordinator to oversee this new program.

Shellfish Advisory Panel

Shellfish fisheries are some of our most historic legacy industries and have been incredibly resilient and valuable. However, the management of these fisheries can be extremely complex because of the multi-jurisdictional responsibilities among the local, state, and federal governments. In recognition of these facts, *MarineFisheries* formed a Shellfish Advisory Panel in 2014 to provide guidance to the agency on emerging issues, matters of concern, and possible solutions with regards to the shellfish industry in the Commonwealth. The group includes harvesters, dealers, researchers, aquaculturists, and municipal shellfish officials. The panel met twice in 2014 to discuss a range of issues and provide industry input (Figure 2).



Figure 2. Shellfish Program Leader J. Michael Hickey provided an overview of the Division’s Shellfish Program at the inaugural meeting of the Shellfish Advisory Panel.

State Fisheries Management

Following below are actions taken and issues confronted by *MarineFisheries* in 2014 unilateral of interstate or federal fisheries management actions.

American Lobster

Lobster Gear Marking: To avoid confusion over lobster gear marking requirements, *MarineFisheries* proposed at a public hearing in December 2013 to remove all references to “branding” gear in the regulations. Consistent with the so-called “buoy branding bill”, signed into law by Governor Patrick in 2011, lobster traps and buoys must only be marked with the permit holder’s identification

number, a reflection of changes in trap construction from wood to plastic and wire. The MFAC supported this modification in March 2014; however, final rules were still pending at year's end.

Recreational V-Notch Possession Rule: Effective April 25, 2014, a recreational v-notch possession standard of $\frac{1}{8}$ " with or without setal hairs took effect state-wide. Under the prior rules, Massachusetts had three different v-notch possession rules for recreational fishermen depending on the area fished: Gulf of Maine, Outer Cape Cod, and Southern New England. These varying possession rules were difficult to enforce because the Division does not issue area-specific recreational lobster permits. Moreover, the rationale for the different rules was obtuse, reducing compliance. A hearing occurred in January 2014, followed by MFAC approval in March.

Ventless Trap Survey: The Division's ventless trap survey is an important tool for determining lobster year class strength and abundance; these data are included in interstate stock assessments. From 2003 to 2012, the survey was funded with grant money, which was no longer available in 2013. In 2014, *Marine Fisheries* was allocated a single year's funding in the state budget to continue the program, but it was clear that a long-term funding solution was needed. Accordingly, the Division worked with the Massachusetts' Lobstermen's Association and members of the Massachusetts Legislature to establish language in the FY15 budget that would allow *Marine Fisheries* to allocate up to \$250,000 annually from the sale of commercial and recreational lobster permits to a dedicated fund used to pay for the ventless trap survey (Chapter 165, Acts of 2014). This dedicated fund was created with the understanding that the Division and the Executive Office of Administration and Finance (ANF) would increase the fees for these permits to off-set the annual cost of the survey. Thus, *Marine Fisheries*, on behalf of ANF, held a public comment period in October and November, including one hearing, to increase commercial and student lobster permits by \$50 and recreational lobster permits by \$15. These fee increases were subsequently adopted, and put in place for 2015 permitting.

Aquaculture Raised Finfish

Sale of Non-Conforming Fish: With a growing market for aquaculture raised finfish and no loss in conservation from allowing these fish to be harvested at times and sizes prohibited in the wild fishery, *Marine Fisheries* proposed at a public hearing in December 2013 to authorize the sale of non-conforming aquaculture raised finfish product provided proper labeling occurred. The possession of these products was prohibited under existing state regulations because they do not differentiate between wild caught and aquaculture raised finfish. The MFAC voted in support of this modification in March 2014; however, final rules were still pending at year's end.

Commercial Permitting

Minimum Age: During 2014, *Marine Fisheries* adopted a policy setting a minimum age of 14 years to obtain a commercial fishing permit. Prior to this, no minimum age was in place save for the Seasonal Lobster Permit (12 years old with parental consent if under 18) and a *de facto* minimum age for commercial shellfish permits (14 years old, by way of the shellfish transaction card requirement to be used in conjunction with a state drivers license or Registry of Motor Vehicles identification card). Consistent with state child labor laws, and to maintain the integrity of the commercial permitting and reporting system, the 14-years old minimum age was instituted by policy.

Mixing Trips: After many discussions with law enforcement staff and the MFAC in 2014, *Marine Fisheries* scheduled public hearings for January 2015 to take comment on a proposal to

restrict fishermen fishing under the authority of a commercial permit from taking or landing a recreational bag limit of fish during the same trip. Allowing this type of activity presents problems for compliance, enforcement, and data collection. The proposed rule would not prevent commercial fishermen from keeping a quantity of their lawfully caught commercial harvest for personal use; an exemption for bluefin tuna would also be included.

Fish Pots

Permitting Revisions: In February 2014, the Division presented three proposals designed to treat the state's fish pot fisheries more like the state's coastal lobster fishery, which is a model for a small sustainable inshore fishery, and to improve compliance with existing regulations. Following approval by the MFAC in March, the following fish pot permitting revisions took effect on June 6, 2014. First, all fish pot permits became owner-operator, meaning that the individual to whom the permit is issued must be on the vessel when commercial fishing under the authority of the permit is occurring (unless otherwise authorized by the Director). Second, the fishing experience criteria for persons to be eligible to obtain a transfer of a fish pot permit were eased to align with those for coastal lobster permit transfers: one year full-time or the equivalent part-time experience in a commercial pot fishery or two years full-time or the equivalent part-time experience in any commercial fishery. Third, in order to restrict persons from circumventing the owner-operator and fish pot limit rules as well as the permit endorsement transfer criteria, it became unlawful for persons to fish multiple species-specific fish pot permits on the same vessel.

Gear Requirements: In March 2014, the MFC approved two regulatory revisions to the fish pot gear requirements that were aired at public hearings in March. These rules became effective June 6, 2014. The first new rule established gear haul out periods for scup and black sea bass pots that start three days after the close of the respective commercial fishery and end three days prior to the start of the respective commercial fishery. This was designed to prevent scup and black sea bass pots from being set to target other fish species. The second new rule requires that all fish pot and conch pots have valid annual trap tags affixed prior to being set for the first time in the calendar year. Previously, there was a window from April 16 to 30 whereby conch pots could be fished without valid trap tags.

Fluke, Scup, and Black Sea Bass

Scup Aggregate Program: At the request of industry participants, *Marine Fisheries* authorized an experimental fishery program exempting draggers endorsed to land scup from the daily trip limit in favor of a weekly aggregate trip limit during the period of May 1–October 31. The purpose of the program was to reduce regulatory discarding and the consequent discard mortality of scup resulting from the occasional large single tow exceeding the daily trip limit. During the May 1–June 9 squid fishery, the weekly limit was 5,600 lbs (corresponding to the 800-lb daily limit times seven open days); during the June 10–October 31 mixed trawl fishery, the weekly limit was 4,000 lbs (corresponding to the 800-lb daily limit times five open days). The weekly limit was enforced via dealer and harvester reports. Participants in the program numbered 19; all were federal permit holders reporting through Vessel Trip Reports.

Scup Commercial Trip Limits: With the approval of the MFAC, *Marine Fisheries* made several in-season adjustments to the commercial trip limits for scup to facilitate full use of the quota. For the period of October 3–31, the daily trip limit was raised to 2,000 pounds for all gear types, and Fridays

and Saturdays were opened to landings. Consistent with federal action, the daily trip limit for the November 1–December 31 Winter II fishery was set at 18,000 pounds.

Fluke Commercial Winter Fishery Pilot Program: For the fourth year, the Division offered letters of authorization (LOAs) to interested fluke permit endorsement holders to land a weekly limit of fluke rather than the standard daily limit (500 lbs) during the Period I Fishery. The pilot program was created at the request of offshore trawl vessel fishermen to assist the fleet in achieving its seasonal allocation (30%) of the annual quota while also reducing regulatory discards. The 2014 pilot program operated with a 1,000-pound weekly limit. *Marine Fisheries* issued 57 LOAs to participate. The program ran from January 1 through April 22, the close of the Period I Fishery (i.e., the Period I Fishery did not achieve its seasonal allocation of the annual quota). To ensure timely monitoring of the quota and compliance with the weekly limit, participants were required to sell their fluke only to authorized dealers who report transactions daily. Due to the success of the program, *Marine Fisheries* planned to reauthorize the pilot program in 2015.

Gear Issues

Surf Clam Dredge Width: At its inaugural meeting in April, the Division’s Shellfish Advisory Panel asked *Marine Fisheries* to review the state’s surf clam dredge width regulations and consider establishing a uniform 48” dredge width to further protect the inshore resource and traditional inshore fishery from opportunistic fishing effort from large-scale federally permitted vessels. Existing regulations restrict surf clam dredges to a maximum width of 48” within all areas of state waters except: 1) those waters south of Cape Cod where the dredge width cannot exceed 100”; and 2) those waters within Chatham where a 16” maximum dredge width applies. *Marine Fisheries* scheduled public hearings for January 2015 to take public comment.

Salem Harbor Purse Seining for Menhaden: Salem Harbor has been a historic area for inshore purse seining activity. In recent years, the harbor has seen an increase in marine traffic, associated with development and construction along the inner harbor. During the summer of 2014, the Salem Harbormaster raised concerns regarding the use of purse seines in certain areas of the harbor, such as the channel, during the mid-day hours when there is a high volume of boat traffic. To address these concerns, *Marine Fisheries* met twice with the Salem Harbormaster’s Office and the area’s two active purse seine fishermen. These meetings resulted in two agreements being reached. First, purse seine activity would be authorized within inner Salem Harbor and the mooring fields from daybreak through mid-day on open fishing days (Monday–Thursday); the mid-day closure would be at the discretion of the Harbormaster based on expected marine traffic. Other areas outside of the channel and inner Salem Harbor would not be subject to this restriction. Second, *Marine Fisheries* would amend its Purse Seine Permit Conditions to require fishermen contact the Salem Harbormaster prior to fishing in any year and provide their contact information. This will allow the Harbormaster to have direct contact with the fishermen regarding their use of the harbor and potential conflicts with marine access.

Green Crabs

Depletion Program: The year 2014 saw heightened concern about the presence of green crabs in Massachusetts ([Figure 3](#)). Some sources suggest that this non-native species’ numbers are beginning to increase in our coastal waters, posing a potential threat to coastal fishery resources. In Maine, where their abundance has definitely and drastically increased, green crabs have been implicated in eelgrass die offs, salt marsh destabilization, and decreased softshell clam and blue mussel landings.

To prevent and mitigate impacts from green crabs, *Marine Fisheries* supported individual and community-based efforts to reduce the green crab population, specifically through trapping. In anticipation of a greater number of traps being deployed, the Division clarified in 2014 the rules under which this activity can be conducted; including the need to obtain a letter of authorization, and adhere to trap limit, season, and open area rules. State legislators from Essex County also worked to provide earmark funding to deplete green



Figure 3. The invasive green crab, *Carcinus maenas*.

crabs in the Great Marsh. Modeling a program after an existing initiative in Ipswich, *Marine Fisheries* had entered into contracts by year's end with the municipalities of Ipswich, Essex, Rowley, Gloucester and Newbury under which they would pay fishermen a fixed price/pound to remove green crabs with standardized trap equipment and the crabs would either be marketed or properly disposed of. Trapping efforts were expected to resume in spring 2015.

Groundfish

State Waters Winter Flounder Trip Limit: Effective May 9, 2014, federal multispecies groundfish permit holders must comply with the state's winter flounder trip limits while fishing in state waters. Previously, these federally permitted fishermen were required to abide by the state's groundfish trip limits when fishing in state waters except winter flounder. *Marine Fisheries* sought to reverse this exemption for winter flounder because a growing directed fishery unconstrained by trip limits would be detrimental to local winter flounder stocks. A public hearing was held in December 2013 and the MFAC voted in favor of the rule in March 2014.

Transiting Rolling Closures in Possession of Groundfish: Since the elimination of the federal groundfish rolling closures as an effort control tool for sector vessels, *Marine Fisheries* had received numerous questions from federal permit holders regarding whether they can transit the state's rolling closure areas with groundfish caught elsewhere. To clarify this situation, the Division drafted a regulation change to specifically allow the transiting of rolling closure areas in possession of groundfish, provided fishing is not occurring, gear is stowed, and the groundfish was legally caught outside of the closure. This matter was aired at a public hearing in December 2013 and approved by the MFAC in March 2014; however, a final rule was pending at year's end.

Horseshoe Crab

Reduced Trip Limit for Trawlers: The spring through fall mobile gear fishery in Nantucket and Vineyard Sounds has traditionally been dominated by small-scale, owner-operator vessels that primarily target squid and fluke and take incidental limits of other species including horseshoe crab. However, a review of harvest data at the request of traditional fishery participants showed a recent increase in horseshoe crab catch and effort by draggers. To some extent this was expected and a preferred shift in fishing effort away from hand harvest on spawning beaches as a result of the lunar

spawning closures, but the Division remained concerned that escalating trawler effort for this stock was still too high, and could also be leading to discarding of other species, especially fluke.

In response, the Division proposed at public hearings in February 2014 to reduce the trip limit to 300 crabs per day, down from seasonal limits of 400 crabs (January–June) and 600 crabs (July–December). After approval by the MFAC in March, the rule change took effect on May 23, 2014.

Quota Managed Species

Fishery Closure Process: Effective April 25, 2014, *Marine Fisheries* codified its procedure for closing the Commonwealth's quota managed fisheries. This process includes publishing a quota closure notice in the Massachusetts Register and via our website and ListServ, and notifying all primary buyers of the species via fax or email. The MFAC approved this action in March 2014, following a hearing in January.

Recreational Fishing Issues

Culpability for Violations on Recreational For-Hire Vessels: During recent years, *Marine Fisheries* had received numerous reports from the Office of Law Enforcement (OLE) regarding incidents of non-compliance with, and difficulty enforcing, size and bag limits aboard for-hire vessels. Under the existing rules, the angler was held accountable, but this did not seem to deter non-compliance, particularly as these individuals often do not hold recreational fishing permits which could be revoked for violations. Consequently, because it is the for-hire vessel permit that exempts patrons from holding their own fishing permit and because vessel captains are already required by the U.S. Coast Guard to ensure all passengers comply with the laws of the country, the Division took to public hearing in February 2014 a proposal to hold for-hire permit holders, operators, and patrons jointly responsible for violations of the recreational fishing regulations. After MFAC approval in April, the rule took effect on July 18, 2014.

At-Sea Filleting: During the 2012 and 2013 recreational fishing seasons, *Marine Fisheries* received numerous reports from OLE regarding the difficulty officers faced in determining compliance with recreational fishing limits when catch is filleted at-sea. The existing regulations varied, with separate and distinct rules for striped bass and groundfish, and no specific rules for all other species. Accordingly, the Division went to public hearing in February 2014 with proposed rules to authorize at-sea filleting under certain criteria; and implement guidelines for enforcing bag limits when catch among anglers has been comingled. In May 2014, the MFAC approved at-sea filleting rules specific to black sea bass and scup, the fisheries in which the law enforcement concerns arose. Effective July 18, these rules require that skin remain affixed to the fillets of scup and black sea bass until the angler reaches the domicile, and prohibit the possession of scup and black sea bass fillets in a quantity that exceeds two times the bag limit. Additionally, for all species, in instances where recreational fishermen have comingled their catch, the comingled catch will be divided by the number of anglers on board the vessel to determine compliance with per angler or per vessel bag limits and fillet limits.

Permitting

Electronic Recreational Permits: Longstanding *Marine Fisheries* regulations require all permit holders, whether commercial or recreational, to carry their signed permit whenever fishing. With the advent of online self-purchasing of recreational permits, this requirement creates an imposition

for recreational fishermen who purchase their permit via a mobile device immediately prior to fishing. *Marine Fisheries* therefore proposed to allow recreational finfish and lobster permit holders to electronically sign the permit and display it via a mobile device if requested in lieu of carrying a signed paper permit. These modifications took effect on August 1, 2014.

Retail Boat Dealer Permit: The original intent of the retail boat permit was to allow for lobstermen to sell live lobsters and crabs, and the occasional finfish, to the general public from the back of their boats while tied up to a dock. However, fisheries management has evolved since this permit was developed and most finfish species are now quota-managed and strictly regulated to control the harvest of that quota. As a result, the sale of finfish under the retail boat permit had become problematic with regards to enforcement, compliance, and the compilation of statistics. Consequently, before year's end, *Marine Fisheries* had scheduled public hearings for January 2015 to take comment on limiting the use of the retail boat permit to the sale of legally caught lobsters and crabs from the back of a boat in the water.

Shellfish Handling

Compliance with Model Ordinance: As the state's shellfish management agency, *Marine Fisheries* must work to ensure that its commercial shellfish industry functions in a manner that complies with the National Shellfish Sanitation Program's Model Ordinance. The Model Ordinance requires all shellfish harvested for human consumption to be harvested from a shellfish growing area that is open to commercial harvest and it imposes tagging requirements for the purpose of recall. The Model Ordinance is enforced through a combination of Department of Public Health regulations and marine fisheries statutes that require that all shellfish in transit be tagged and dealers purchase shellfish that has been tagged demonstrating it was harvested from an area open to commercial harvest. In 2014, *Marine Fisheries* adopted regulations to complement the existing laws and regulations and fill in details regarding when the harvester is to complete the tag (i.e., at time of harvest) and the specific information required on the tag (i.e., harvester name, DMF ID, date and time of harvest, type and quantity of shellstock, and shellfish growing area). These rules were first implemented by emergency action effective May 23; following a public hearing in June, they were implemented as final regulations.

2014 *Vibrio* Control Plan and Implementing Regulations: Since 2012, the U.S. Food and Drug



Figure 4. An aquaculture grant in Barnstable Harbor.

Administration has required Massachusetts to develop and implement a plan to minimize the risk of illness associated with *Vibrio parahaemolyticus* related to the consumption of raw oysters. These plans are crafted by *Marine Fisheries* and the Massachusetts Department of Public Health (*MassDPH*) and establish certain time-to-temperature, labeling, and reporting standards for the commercial harvest of wild and aquaculture-raised oysters to safeguard public health (Figure 4). In 2012 and 2013, the *Vibrio* Control Plan was established through permit conditions to an individual's commercial

fisherman and/or shellfish propagation permit. (MassDPH implemented by regulation those parts of the Control Plan relevant to dealer requirements.)

For 2014, *Marine Fisheries* implemented first-ever regulations to establish the Control Plan in order to improve enforcement and compliance. Due to timing constraints, emergency regulations were put in place effective May 23. Public comment was accepted during May and June, including at one hearing. Final regulations were promulgated following MFAC approval in August; these final regulations did not differ from the previously filed emergency regulations.

The 2014 *Vibrio* Control Season was in effect from May 19 to October 19. During this time period, *Marine Fisheries* regulations required all harvesters to cover oysters in ice or an ice slurry within two hours of harvest or exposure to air and shade all oysters during harvest and transport. Aquaculturists were subject to additional reporting and harvesting restrictions governing off-site culling, anti-fouling practices, wet storage, and handling recalled oysters. *Marine Fisheries* also established a new protocol to expediently suspend permits if there is reasonable cause to believe the permit holder violated the *Vibrio* management regulations; this protocol is similar to that *Marine Fisheries* requires of shellfish diggers involved in the harvest of moderately contaminated shellfish.

In November, *Marine Fisheries* held a public meeting to solicit feedback prior to development of a *Vibrio* control plan for 2015. Official public comment on the 2015 control plan and implementing regulations would take place in late winter or early spring 2015.

Spiny Dogfish

Experimental Short-soak Gillnet Fishery: *Marine Fisheries* reauthorized, for a third year, the experimental short-soak gillnet dogfish fishery in the October–November groundfish closure in state waters (Plymouth north to Marblehead). The spiny dogfish fishery has been unable to land its quota in recent years and the Division already allows longlining for spiny dogfish during this time-area closure. Three letters of authorization were issued to participate in the experimental fishery with conditions including net tending and monitoring requirements. Access to the area was subject to revision if regulatory discards became problematic.

Squid

Use of Small Mesh South of Nantucket and Martha's Vineyard: Effective July 4, 2014, *Marine Fisheries* authorized the use of small mesh (less than 6.5" cod-end) for squid trawling south of the islands from June 10–December 31 or the end of the commercial fluke fishery (Figure 5). This regulation codified a pilot program that since 2010 had allowed a small number of vessel operators to continue towing small mesh after the April 23–June 9 squid season in this area due to the continued presence of squid, as well as federal rules allowing small mesh squid fishing in adjacent EEZ waters during this period. Limited, yet generally supportive, public comment had been collected in December 2013, and the MFAC had voted in favor of the season extension in March 2014.

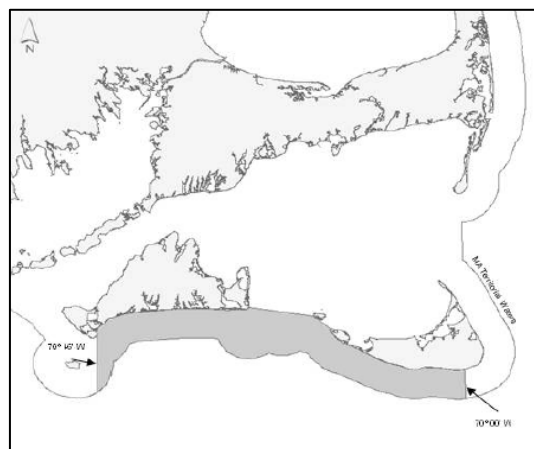


Figure 5. The small mesh squid exemption area (grey shading) implemented in 2014.

Shortly after the rule change was announced, *Marine Fisheries* was contacted by Nantucket fishermen and town officials stating that they were inadequately informed of the rule change, and had they been, they would have opposed it based on various concerns including discard mortality, habitat impacts, and forage fish reduction. Town officials requested *Marine Fisheries* to take an emergency action to rescind the rule. *Marine Fisheries* declined, partly because the fishery had moved out of state waters by the time an emergency action could have taken effect. Instead, the Division would propose a regulatory revision for 2015. Hearings were scheduled for January 2015.

Striped Bass

Commercial Management Measures: Following several years in which striped bass have shifted their normal distribution to aggregate off the coast of Chatham each summer, affecting the dynamics and performance of the Commonwealth's commercial fishery, the Division took to public hearing in February 2014 a suite of proposals to modify the fishery's regulations. These aggregations have led to heavy, concentrated, and efficient fishing effort (Figure 6); resulting in user conflict, condensed seasons, quota overages, reduced ex-vessel value, and local depletion.

Following MFAC approval in March, new rules became effective June 6, 2014. These rules: moved the fishery start date from July 12 to June 23; reduced the number of open fishing days per week from four to two, specifically Mondays and Thursdays; developed a two-tier landing limit system based on the type of commercial fishing permit held and lowered the daily landing limit, specifically a 15-fish daily limit for harvesters with a Commercial Boat or Lobster Permit and a 2-fish daily limit for harvesters with a Commercial Individual or Rod & Reel permit; adopted a control date of September 8, 2013, by which participation in the fishery may be restricted in the future; and required for-hire operators to adhere to the recreational fishing regulations during a charter while allowing for the sale of striped bass caught during the charter provided the fish conforms to all commercial striped bass regulations and a Striped Bass Endorsement is held.



Figure 6. Concentrated fishing effort for aggregations of striped bass off Chatham.

Reducing Stockpiling: The Division received primarily positive reviews of the changes enacted to commercial striped bass management in 2014, given the improved ex-vessel value and longer season. A common complaint, however, was that the revisions had increased the illegal practice of stockpiling; fishing recreationally on a closed commercial day and selling the fish on a subsequent open day. This type of unlawful activity is difficult to detect and prevent because no misconduct is committed until well-after the catching and landing of the fish and irrefutably establishing the

harvest date of fish brought to market would require prolonged surveillance. In the meantime, the Division became aware of a management measure used in the Alaskan salmon fishery to distinguish fish caught for subsistence and thus prohibited from entering commerce. These salmon must be marked by caudal fin clips and any such marked fish may not be bought or sold. *Marine Fisheries* thus developed a proposal to require pectoral fin clipping of striped bass caught by commercial harvesters on closed commercial days. Hearings were scheduled for January 2015.

Tautog

Minimum Size: In 2013, law enforcement officers asked *Marine Fisheries* to reconsider the regulatory language providing the Commonwealth's 16-inch minimum size for tautog. Through this language, the minimum size applied only to commercial and recreational fishermen. Consequently, officers reported difficulty enforcing the minimum size at dealers, resulting in the sale of undersized tautog. To close this loophole, the Division proposed in January 2014 to revise the size limit to apply to all persons. Following approval by the MFAC in March, a new rule took effect April 25, 2014.

At the same hearing, *Marine Fisheries* took comment on prohibiting the possession of tautog by any dealer five days after the seasonal closure. Allowing an extended live market for tautog after the commercial fishery closure provides a receptacle for fish caught illegally outside the season. At the request of the MFAC, comment was also sought on amending the commercial fishing season. Action on these proposals was deferred until further development by the Division and a subcommittee of MFAC members.

Whelk

Knobbed Whelk Minimum Size: In February 2014, the Division proposed to increase the minimum size for knobbed whelk by two consecutive annual increases of 1/8" beginning in 2014, taking it from 2 3/4" (width) to 3" by 2015. This would mirror the size increases approved for channeled whelk in 2013 based on a size-at-maturity study for that species. A second maturity study by Division biologists of the knobbed whelk indicated the species also warranted more spawning protection; only 10–15% of females are sexually mature at the 2 3/4" size limit, whereas a 3" limit would protect 25% of females until maturity. Aligning the two species size limits would also aid in compliance and enforcement. Following MFAC approval, the new size limits were codified on May 23, 2014.

Trawl Vessel Trip Limit: The mobile gear fishery in Nantucket and Vineyard Sounds has traditionally been dominated by small-scale, owner-operator vessels that primarily target squid and fluke and take incidental limits of other species including whelk (Figure 7). However, a review of harvest data (precipitated by reports of escalating fishing effort targeting whelk) documented a doubling of mixed whelk landings by trawlers from 2012 to 2013, with a four-fold increase in the number of trips landing over 1,000 pounds. This raised concerns due to the slow-growing and localized nature of the species and a downward abundance trend in the Division's trawl survey over the past decade.



Figure 7. Channeled whelk, *Busycotypus canaliculatus*.

In response, and having met with industry members in 2013, the Division brought to public hearing in February 2014 proposals to constrain the harvest of whelks by draggers. In March, the MFAC approved a 1,000-lb mixed channeled and knobbed whelk trip limit for trawl gear, which took effect May 23, 2014.

Possession Limits: During the spring and summer, *Marine Fisheries* received comments from the public expressing concerns about the potential emergence of largely unregulated commercial and recreational SCUBA/hand harvest fisheries for whelks. To prevent negative impacts on the Commonwealth's traditional whelk fisheries, for which there is substantial economic investment, the Division scheduled public hearings for January 2015 to take comment on two possession limit proposals: a 15-whelk recreational limit (consistent with the recreational lobster limit), and a commercial SCUBA/hand harvest limit as low as 100 pounds (commensurate with recent harvest levels).

Discarding of Whelks: *Marine Fisheries* was also contacted by a shellfish constable concerned that some whelk fishermen appeared to be retaining undersized whelks and relocating them near-shore. This activity may have been pursued as a means to seed areas less abundant with whelks. The Division scheduled public hearings for January 2015 to take comment on a proposal to require immediate release of undersized whelks.

Interstate and Federal Fisheries Management

Following below are actions taken and issues confronted by *Marine Fisheries* in 2014 to address interstate or federal fisheries management actions.

American Eel

ASMFC Addendum III: To comply with Addendum III to the interstate FMP for American eel, the Division took to public hearing in January proposals to: increase the minimum size from 6 inches to 9 inches; decrease the recreational daily bag limit from 50 fish to 25 fish, with an exemption for for-hire vessels to retain 50 fish; prohibit the use of eel pots with mesh size smaller than ½" by ½"; and implement a September 1 – December 31 closed season for fyke nets. These measures responded to the 2012 stock assessment's finding that the stock is at or near historically low levels and in need of mortality reductions at all life stages. Following approval by the MFAC in March, the measures took effect on April 25, 2014.

ASMFC Addendum IV: Some of the management proposals originally included in Addendum III (above) were transferred into Addendum IV, allowing for additional development. Following ASMFC public hearings along the coast, including one in Massachusetts in July, Addendum IV was passed in October. Its major provisions establish a coastwide commercial quota for yellow eel fisheries, reduce Maine's glass eel quota, provide a mechanism for other states to enter into the glass eel fishery via conservation programs, and allow for the continuation of New York's silver eel weir fishery in the Delaware River. Massachusetts does not need to alter its regulations for 2015, but may need to implement a state-specific yellow eel quota in the future if the coastwide yellow eel quota is not effectively managed.

American Lobster

OCCLCMA Haul Out: As part of the interstate management plan for lobster, the Division has required a two-month gear haul-out period to control fishing effort in the Outer Cape Cod Lobster

Conservation and Management Area (OCCLCMA). In February, *Marine Fisheries* accepted public comment on shifting the haul-out period from January 15–March 15 to February 1–March 31 (beginning in 2015), to better correspond to when right whales are abundant in the area and thus reduce the risk of entanglements. The MFAC approved the shift in April; however, the agency delayed adoption of the rule change to await NMFS making the same change in the federal regulations. In the meantime and in response to the Atlantic Large Whale Take Reduction Plan (ALWTRP), NMFS enacted a new fixed gear closure from February 1–April 30 off the coast of Massachusetts that encompassed all of OCCLCMA (Figure 8). This closure originally included January and omitted part of the OCCLCMA, but was shortened and enlarged at the request of *Marine Fisheries* on behalf of industry members to reduce the economic impact without sacrificing whale protection. Consequently, the Division planned to implement emergency regulations before February 1 to both adopt the ALWTRP closure and alter the OCCLCMA haul-out period such that both will be February 1–April 30. Public comment would be subsequently collected to promulgate final rules.

The ALWTRP also called for NMFS to adopt a ban on commercial fishing single pots (lobster as well as fish and conch) in state waters and establish minimum trap counts to use two buoy lines. *Marine Fisheries* had significant concerns about safety impacts on Massachusetts' small vessels involved in these fisheries, and consequently submitted an exemption request. At year's end, staff was preparing to support its exemption request at a Take Reduction Team meeting scheduled for January 2015.

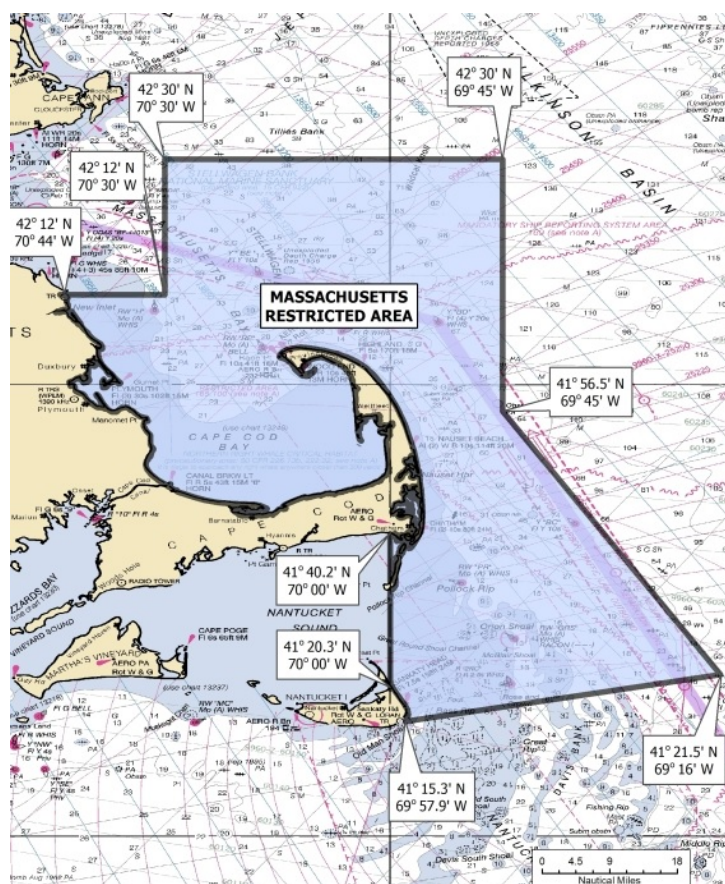


Figure 8. The Massachusetts Restricted Area is closed to all fixed gear from February 1 to April 30.

Atlantic Herring

ASMFC Addendum VI: In August 2013, the ASMFC approved Addendum VI to the interstate FMP for Atlantic Herring to better manage the sub-annual catch limits (sub-ACLs) for the four Atlantic herring management areas. To comply with the new requirements by the start of the 2014 fishing year, *Marine Fisheries* implemented emergency rules effective May 9, 2014 that allowed for seasonal splitting of the sub-ACLs, and established quota triggers for the sub-ACLs and stock-wide ACL with the flexibility to allow for annual revisions. Following a public hearing and MFAC approval in June, final rules were implemented August 1.

Annual Specifications: The MFAC approved days-out for Management Area 1A in accordance with the ASMFC Atlantic Herring Section's decisions.

NEFMC Framework 4: In May 2014, the NEFMC approved Framework 4 to the federal FMP for Atlantic Herring to better ensure accurate and verified catch weights in the fishery. In addition to third party catch verification measures a 15-nm move-along rule will now apply to slippage due to safety issues, mechanical failures, and encounters with dogfish schools.

Fluke, Scup, and Black Sea Bass

Annual Recreational Measures: Pursuant to decisions made by the ASMFC, *Marine Fisheries* revised the regulations for the 2014 harvest of black sea bass and maintained status quo measures for fluke (summer flounder) and scup. *Marine Fisheries* hosted an ASMFC public hearing on Draft Addendum XXV in January 2014, which when finalized impacted the state's selection of fluke and black sea bass measures for the upcoming season. Due to the timing of the complex federal/interstate process for setting recreational limits for these species, modification to the state's black sea bass rules required emergency action.

For black sea bass, Addendum XXV continued the regional management approach in place the last several years. Because harvest under status quo regulations was estimated to exceed the 2014 RHL, a harvest reduction of 7% was required. Via emergency regulations effective May 9, *Marine Fisheries* shortened the black sea bass season by 52 days (primarily in September and October) while doubling the possession limit to 8 fish to achieve the required reduction. However, because a small number of for-hire businesses rely on attracting out-of-state clients in the fall, a special access program was offered with a 20-fish bag limit throughout September provided participating vessels adhered to a June through August closed season. A public hearing was held in June to codify the rules.

Addendum XXV also established a new ad hoc regional approach for fluke in 2014 with the intent of providing more equity in harvest opportunities among states (particularly in New York). Initially, Massachusetts was coupled with Rhode Island into a region, but the two states could not agree to matching regulations, and thus asked the Board to overturn that decision. It did and both states were able to maintain status quo regulations which were projected to keep harvest within their combined ad hoc limit. Regarding scup, the states in the northern region (Massachusetts to New York) agreed to status quo management given a stable recreational harvest limit.

Groundfish

Southern New England Winter Flounder Recreational Season: Effective May 9, 2014, *Marine Fisheries* liberalized the recreational season for winter flounder caught in the Southern New England management area to span from March 1 to December 31. This action, which replaced the existing 60-day season, was taken by emergency rule-making for consistency with the annual specifications approved by the ASMFC. The final rule was instituted after a public hearing and MFAC approval in June.

Groundfish Disaster Economic Assistance Program: *Marine Fisheries* spent the first half of 2014 engaged with other state directors and the NMFS Greater Atlantic Regional Administrator in developing a Groundfish Disaster Economic Assistance Program, for the distribution of \$32.8 million in federal disaster aid monies. The aid stems from a September 13, 2012 disaster declaration in the Northeast multispecies (groundfish) fishery by the Acting Secretary of Commerce. The disaster

designation was requested by the Commonwealth in recognition of the severe hardships being faced by commercial fishermen. On May 28, 2014, NMFS announced a consensus framework whereby the funds would be apportioned between three themes (roughly \$11 million in each): one-third for direct assistance to qualifying federal fishery participants, one-third for state developed programs to address the specific needs of their fishing communities, and one-third for a regional federally-funded buyout or industry-funded buyback. Excluding the latter, the Commonwealth of Massachusetts was to receive \$14.6-million: \$6.3-million in direct subsidies to pre-identified active commercial groundfishermen (Phase 1) and \$8.3-million for additional assistance strategies in a state program (Phase 2).

During the second half of 2014, *Marine Fisheries* was immersed in implementing the Phase 1 direct assistance program and developing the Phase 2 state assistance strategies. *Marine Fisheries* began Phase 1 payments to qualified federal limited access groundfish permit holders in August 2014. Twenty payments, for which *Marine Fisheries* awaited the proper signed paperwork from qualified entities, remained outstanding at the end of the year.

Our Phase 2 program was developed through a public and transparent process that aimed to be as timely and sensible as practicable. An Industry-based Working Group met twice in the summer of 2014 to assist in refining proposed spending strategies. *Marine Fisheries* vetted these strategies through a series of public meetings held in coastal towns throughout Massachusetts during July. *Marine Fisheries* then presented a revised spending plan to the Working Group in September. After revising some aspects of the proposal, the Working Group strongly endorsed by consensus the state's proposed spending plan, recognizing some details would require further development by *Marine Fisheries*. On October 24, 2014 *Marine Fisheries* submitted a final grant application to NMFS for approval of Phase 2 funding and as of the end of the year was awaiting formal grant approval.

Horseshoe Crab

Asian Horseshoe Crab Ban: Effective April 25, 2014, state regulations banned the importation, transportation, possession, sale, attempted sale, or release into state waters of three Asian horseshoe crab species. The prior year, the ASMFC approved a resolution encouraging all member states to ban the possession and distribution of these species due to environmental and human health concerns associated with their use as bait. With a reduction in the availability of indigenous horseshoe crab in the U.S. whelk and eel pot bait markets, interest in the Asian horseshoe crab as an alternative bait had been increasing. A public hearing was held in December 2013 and the MFAC voted in favor of the rule in March 2014.

Jonah Crab

ASMFC Fishery Management Plan: Cancer crabs (a collective term for Jonah and rock crabs) have long been an important bycatch for lobster fishermen; however, in recent years, a directed fishery has cropped up under increased market demand. In response, the ASMFC initiated the development of an interstate FMP to ensure a sustainable targeted fishery develops. In September, Massachusetts held a public hearing on the ASMFC's Public Information Document, the first step in the FMP development process. These hearings indicated that Jonah crab was the primary species of concern, thus the ASMFC moved forward with the development of a Jonah Crab Interstate FMP at the end of the year.

Northern Shrimp

Harvest Moratorium: In November, the ASMFC's Northern Shrimp Section approved a moratorium for the 2015 commercial fishery. This action was taken in response to the findings of the 2014 Stock Status Report, indicating current fishable biomass at the lowest recorded level. The Technical Committee considers the stock to have collapsed with little prospect in the immediate future given continuing unfavorable environmental conditions (increasing water temperatures and declining phytoplankton abundance). Accordingly, following a public comment period and approval of the MFAC in November, *Marine Fisheries* declared a harvest moratorium for northern shrimp effective January 1, 2015.

Monomoy National Wildlife Refuge

In 2014, the U.S. Fish and Wildlife Service released its Draft Comprehensive Conservation Plan and Environmental Impact Statement for the Monomoy National Wildlife Refuge (NWR). This document will guide refuge management decisions over the next 15 years in order to promote NWR priorities of (1) maintaining the biological integrity, diversity, and environmental health of the refuge; and (2) facilitating compatible wildlife-dependent recreation. Leading up to and following the release of this document, *Marine Fisheries* staff worked to provide information on the traditional recreational and commercial fishing activity occurring in the area, including some predating this refuge's designation. Some of the proposed management strategies would impose prohibitions or additional restrictions on some these longstanding fishing activities. The Division assisted the Town of Chatham in requesting and receiving an extension to the public comment deadline, and submitted (in conjunction with *MassDFG* and its other Divisions) extensive comments on the draft CCP/EIS. Heading in to 2015, staff planned to continue engagement on this issue to alleviate potential impacts to fisheries where possible.

Spiny Dogfish and Coastal Sharks

Hammerhead Shark Recreational Size Limit: In October 2013, the ASMFC approved an increase to the hammerhead shark recreational size limit as part of Addendum III to the interstate FMP for Atlantic coastal sharks. This size limit increase from 54 inches to 78 inches fork length was based on new size-at-maturity research. To maintain compliance with interstate requirements, *Marine Fisheries* adopted the new size limit effective April 25, 2014, following a public hearing in January and approval by the MFAC in March.

Spiny Dogfish Trip Limit: In early August, the ASMFC Spiny Dogfish Management Board voted to increase the commercial trip limit for spiny dogfish from 4,000 lbs to 5,000 lbs. *Marine Fisheries* had not supported the increase at the Board meeting due to concerns about a negative effect on Massachusetts' small boat dogfish fishery's profitability. Nonetheless, with neighboring states expected to increase their trip limit accordingly, *Marine Fisheries* used the declaration process embedded in the state's dogfish regulations to adjust the trip limit to 5,000 lbs effective September 8, in concert with a federal increase.

ASMFC Spiny Dogfish Addendum V: During September, *Marine Fisheries* hosted two ASMFC public hearings on Draft Addendum V; it was subsequently approved by the ASMFC in November. Addendum V replaced the interstate plan's allowance to remove spiny dogfish fins at sea provided the fins and carcasses are retained and meet a certain fin-to-carcass ratio, with a requirement that fins remain naturally attached through landing to ensure consistency with the Shark Conservation

Act of 2010. This revision, once also implemented at the state level, would have little effect on Massachusetts commercial spiny dogfish fishermen as they land this species whole already. State hearings were scheduled for January 2015.

Striped Bass

ASMFC Addendum III: In response to a multistate and federal investigation into illegal activity in the commercial striped bass fishery, the ASMFC adopted Addendum III in 2012, requiring each state with a commercial striped bass fishery to implement a tagging program for that fishery with the purpose of increasing accountability in the supply chain and thereby giving law enforcement a greater ability to detect poaching. Accordingly, Massachusetts needed to implement either a point-of-harvest or point-of-sale tagging program prior to its 2014 commercial striped bass season.

With input from an industry advisory group, *Marine Fisheries* developed a proposal for a point-of-sale (dealer) tagging program that would meet the addendum's specific requirements pertaining to tag distribution, accountability, and monitoring. A point-of-harvest system was not selected, because of the administrative burden of issuing tags (and retrieving un-used tags) from over 4,000 permit holders. Three hearings were held in February 2014 and the MFAC voted to approve the tagging program in March 2014. The regulations became effective June 6, 2014.



Figure 9. A striped bass tagged by a dealer after purchase from a commercial fisherman.

Under the program, primary buyers of striped bass must affix a valid, *Marine Fisheries*-issued Striped Bass ID Tag to each striped bass at the place of primary purchase and prior to transit (Figure 9). The tags must remain affixed to whole striped bass until the fish are processed into fillets, thereafter the tags must accompany the fillets while in possession for re-sale. Tags are to remain on the premises of retail seafood dealers or food establishments until all portions are sold, thereafter the tags must be cut into two pieces and discarded. Primary buyers are subject to tag accountability measures following the close of the commercial striped bass season.

ASMFC Addendum IV: In August, the ASMFC approved Draft Addendum IV for public comment in response to the findings of the 2013 benchmark stock assessment that “fired” one of the management triggers in the interstate management plan. N. Meserve served on the ASMFC Striped Bass Plan Development Team leading up to the document’s release. Massachusetts hosted four public hearings on the draft addendum during September.

In October, the ASMFC approved the addendum with options to modify the fishing mortality target based on the best scientific advice, and then reduce harvest in order to return fishing mortality to a level at or below the target rate. Addendum IV adopts a 25% harvest reduction from 2013 levels for coastal fisheries, and 20.5% harvest reduction from 2012 levels for the Chesapeake Bay fisheries (this lower reduction is due to the Bay jurisdictions taking a 14% cut in 2013 based on their management program). For the coastal fisheries, the Addendum reduces the commercial quotas by

25% and decreases the recreational bag limit to 1 fish; however, states may implement alternative state-specific recreational measures if they can demonstrate that the measures will have the same conservation value. All states/jurisdictions must promulgate regulations to achieve the reductions prior to the start of their 2015 fisheries. At the end of the year, *Marine Fisheries* had scheduled four public hearings in January 2015 to take comment on several options to achieve the 25% recreational harvest reduction in Massachusetts (our commercial quota is automatically cut 25%).

Conservation Engineering Project

Conservation Engineering (CE) collaborates with members of the commercial fishing industry and others to understand and to improve the design and performance of fishing gear and fishing practices, and to reduce impacts of fishing gear on non-target species. CE's stature continues to grow regionally and internationally through strong relationships with industry members, collaborative projects, peer-reviewed publication, and participation in national and international organizations. CE personnel's strengths include experimental design, fieldwork, data analysis, report writing, and project administration.

Redeveloping a Sustainable Redfish Trawl Fishery in the Gulf of Maine

This activity is a multi-year, NOAA Fisheries-funded network of gear researchers, net makers, fishermen, NOAA Fisheries Regional Office and Science Center members, Council staff, fish processors, and others working to re-establish the redfish trawl fishery in the Gulf of Maine. CE's leadership role in the network includes financial administration, contract management, equipment coordination, experimental design, data collection and analysis, and report writing.

Activity in 2014 centered on design and execution of a component examining timing of escape of undersized redfish using underwater cameras, and testing of a double grid system to encourage the escape of small fish when a trawl is on bottom ([Figure 10](#)). The purpose of this research is to improve the sustainability of the fishery by minimizing mortality of juvenile redfish that encounter the trawl. Following progress and planning meetings among the project partners, CE personnel led two six-day trips at sea on a commercial vessel in July and August. Data were successfully collected and under analysis at year's end.



Figure 10. David Chosid and Mike Walsh make adjustments to a sorting grid system designed to reduce catches of small redfish.

CE personnel presented results from 2013 to the NEFMC Research Steering Committee; network members used these results to support Sector exemption requests. Commercial Fisheries News published an article on this project in early 2014. CE personnel made presentations on selectivity results from 2013 at the ICES-FAO Working Group on Fishing Technology and Fish Behaviour in New Bedford in May, and at the American Fisheries Society Annual Meeting in Quebec City in August. Personnel were invited to review sustainability assessments of the redfish fishery by environmental organizations. Scientific manuscripts from the 2013 data were under development.

Conservation Engineering Marine Fisheries Initiative

Funded by NOAA Fisheries, this multi-year initiative worked closely with groundfish fishermen who participate in “sectors,” voluntary cooperatives of vessel owners who pool their allocations. This initiative works to identify vital, immediate gear research that could assist them in their continuing adjustment to sector management under new catch limits. CE’s role as network coordinator required establishing the network, setting up regular participant meetings, maintaining contact and coordination with funders and co-PIs, purchasing equipment, contracting with vendors, and providing substantial budgetary and administrative leadership and oversight. As a scientific partner, CE met with sectors to develop and implement proposals and field research, analyze data, produce final reports, and review other reports.

Over 35 projects were funded through this initiative, with CE playing a variety of roles in all. Overall, more than 96 individual fishermen and others participated in these projects, with fieldwork spanning from Maine to Rhode Island. In general, fishermen developed research projects in six themes: saving fuel (11 projects), trawl selectivity (9), seabed impact (2); gillnet selectivity (7); alternative gear (4) and education (1).

Several highlights among the projects’ outcomes include: the adoption of small-diameter large-mesh trawl netting, semi-pelagic doors, and fuel flow meters to reduce fuel consumption (and seabed contact, in the case of the doors); the invention of an innovative self-closing codend that allows fishermen to limit catches to predetermined levels; and distribution of harbor-porpoise reducing, easier-compliant gillnet pingers at minimal cost. Intriguing research included the possibility for species separation using raised footrope gillnets, reinforcement of the cod-avoiding properties of “topless” trawl nets, and the possibility that topless nets could reduce bycatch of white hake. Left for further development were the possibility of fuel-saving paravanes and the economic viability of cod pots. The value of bringing fishermen to a flume tank was once again reinforced, with the highest level of participation yet from the region.

CE participated in and led targeted outreach activities in a variety of places along the coast including the Maine Fishermen’s Forum, the International Seafood Show, Reidar’s Manufacturing in New Bedford, and Superior Trawl in Narragansett, RI. More details on this project, including reports on the individual projects, can be found at www.gearnetwork.org.

ICES-FAO Working Group on Fishing Technology and Fish Behaviour

Marine Fisheries co-sponsored the annual meetings of this working group and the Working Group on Fisheries Acoustics, Science and Technology in New Bedford (May 5-9). Under CE leadership, 129 scientists from 24 different countries met to discuss current developments in their respective fields. Selected topics from the meetings included:

- Reviews of dynamic catch control devices in commercial fishing gears

- New and innovative applications of artificial light in fishing gears
- Relationships among vessel power characteristics and gear specifications
- Innovative trawl spreading devices
- Applications of acoustic methods to characterize ecosystems
- Acoustic properties of marine organisms
- Best practices and guidance for acoustic estimates of biomass

CE chaired the organizing committee, taking on extensive administrative duties to host the successful meetings, from agenda development to permit acquisition to vendor coordination. CE staff presented on recent research activities and results.

Other Activities

Michael Pol continued serving on the ICES-FAO Working Group on Fishing Technology and Fish Behaviour following his term as chair. As such, he chaired the organizing committee as host of the 2014 meeting in New Bedford. Pol also continued serving on the NEFMC Research Steering Committee, and the ASMFC Fishing Gear Technology Workgroup. Pol participated on a review panel for the GMRI Sustainable Harvest program for GOM and GB Atlantic cod.

David Chosid presented CE's spiny dogfish research and contributed to the Spurdog Bycatch Workshop meeting in Exeter, England on April 3 by invitation and sponsorship of the UK Centre for Environment, Fisheries and Aquaculture Science (CEFAS).

Pol co-led and presented at a symposium (Fishing Gear Selectivity and Selective Fishing: Means, Methods and Implications) at the Annual Meeting of the American Fisheries Society and attended the meeting (August 17-21) in Quebec City. Pol was guest editor for the journal *Fisheries Research* for an accompanying issue.

CE developed an advisory to assist commercial fishermen in cod bycatch challenges based on CE research that was distributed via *Marine Fisheries'* listserv.

CE continued to provide vital assistance and support to *Marine Fisheries* Resource Assessment Project's trawl and seine surveys. A research project using *Marine Fisheries* Habitat Program's sidescan sonar to measure survey net performance was initiated.

CE continues to build partnerships with other researchers, fishermen, and other organizations. For a recent round of funding availabilities, CE was invited to partner with five other research organizations on eight proposals, as well as leading on four of its own.

CE continued to provide frequent peer-review to proposals, reports, and scientific papers for funding agencies and scientific journals.

Outreach

Project personnel organized *Marine Fisheries* booth for the 11th annual New Bedford Working Waterfront Festival ([Figure 11](#)).

A new video, "Spiny Dogfish and Winter Flounder Behaviors Around Hooks with Artificial Bait and Squid," was added to *Marine Fisheries'* YouTube channel. It joined other CE videos among the most viewed on the channel. CE has acquired digital storage as a plan to make its video library more accessible, and has begun digitizing its extensive library of underwater and fishing gear video.



Figure 11. *Marine Fisheries* biologist David Chosid teaches two young New Bedford Working Waterfront Festival attendees about ocean pout.

Other Activities

Publications

DMF News: *Marine Fisheries* published its newsletter twice in 2014. These editions of “DMF News” were mailed to subscribers and are available through the Division’s website.

Annual Report: *Marine Fisheries* published its 2013 Annual Report.

Coordination of NEFMC Nominations

As in years past, *Marine Fisheries* coordinated the process of gubernatorial nominations to vacant seats on the NEFMC, including solicitation of potential candidates and submission of nominations by the Governor’s office. In addition to the usual nomination process that takes place annually, *Marine Fisheries* coordinated a second suite of nominations to fill an unanticipated vacancy upon the November 2014 resignation of a Massachusetts at-large member.

Leadership Positions

Director Paul Diodati continued to serve as co-director of the Massachusetts Marine Fisheries Institute (MFI). Both Director Diodati and Deputy Director Pierce served on the MFI Executive Committee. Deputy Director Pierce was vice chair of the NEFMC’s Groundfish Committee and Risk Policy Working Group, chair of the Joint NEFMC-MAFMC Spiny Dogfish Committee, and served on the NEFMC’s Executive Committee. Deputy Director Daniel McKiernan chaired the ASMFC American Lobster Management Board, and the agency’s Shellfish Advisory Panel.

Management Information Systems and Fisheries Statistics Program

Personnel

Thomas Hoopes, Program Coordination
Kim Lundy, Dealer Reporting Coordination & Quota Monitoring
Anna Webb, Harvester Reporting Coordination
Erich Druskat, Fisheries Data Analyst
Mary Ann Fletcher, Fisheries Data Entry
Rosemary Mitchell, Permitting & Support for Fisheries Reporting
Whitney Sargent, Permitting & Support for Fisheries Reporting

Overview

The **Management Information Systems (MIS) Project** provides many services to *Marine Fisheries* under the umbrella of information systems/technology including: local area network maintenance; PC and server maintenance; Internet and Intranet website development and maintenance; Oracle database development and maintenance and geographic information systems (GIS) data development and assistance.

The **Fisheries Statistics Project** collects fisheries dependent data from both commercial harvesters and dealers designated as primary buyers. Both data sets are collected in a standardized trip-level format from all commercial permit holders. These data are used in many ways, both within *Marine Fisheries* and to fulfill requests made from outside the agency. Project personnel also participate in the planning and development of the Atlantic Coastal Cooperative Statistics Program (ACCSP) and provide support to administrative staff for policy as well as permitting staff to issue permits from the Gloucester facility.

Management Information Systems Project

Website Maintenance

The *Marine Fisheries* website (www.mass.gov/marinefisheries) continued to be an extremely useful means of distributing information as does an internal Intranet site using Wiki technology, which provides both agency-wide as well as project-specific functionality to agency personnel. A Statistics Project Intranet site is also maintained for display of quota information, reporting compliance, and both harvester and dealer reporting information. Much of what is displayed on the Statistics Project site is run from automated scripts that run on a regular basis. Maintaining those scripts to add new data and accommodate changing requirements is an ongoing task.

Oracle Database / Application Development & Maintenance

Marine Fisheries continued to use and enhance four production databases during 2014: Commercial Permits and Statistics; Lobster Sampling; Shellfish Sampling & Area Management; and Time Tracking for Federal Grants. Some minor updates were made to the Commercial Permits and Statistics

application during the year, mainly to accommodate new fees, endorsement types, and tracking businesses with sanctioned shellfish harvesters.

GIS Technical Assistance & Data Development

Individual programs and projects continued to develop and maintain their own GIS datalayers, and support was provided in specific cases.

Fisheries Statistics Project

Dealer Landings Data Collection

Landings or purchases of all marine species by seafood buyers from commercial fishermen were collected as part of the dealer reporting program. Since 2005, all primary buyers not already required by federal law to report electronically have been required to report under state regulations. All data from these state-reporting dealers were entered electronically by dealers or submitted to *Marine Fisheries* via paper forms and entered into the ACCSP Standard Atlantic Fisheries Information System (SAFIS) database by project personnel. All quota-based fisheries are monitored using these dealer data stored in the SAFIS database.

In 2014, 1,779 businesses obtained a Massachusetts dealer permit. Of those, 465 (or 26%) were categorized as primary buyers, which meant they intended on purchasing marine species directly from fishermen. These dealers were required to report their primary purchases, including products retailed themselves. Of the 465 dealers, 216 had a federal dealer's permit which required reporting electronically either to the SAFIS database or to another federal reporting system. These dealers were categorized as "federal-reporting." The remaining 249 dealers were categorized as "state-reporting." Compared to previous years, these figures are relatively unchanged.

Even though many of the primary buyers in 2014 had been primary buyers in years past, all were required to complete paperwork to confirm their buying intentions and their commitment to the dealer reporting requirements. This registration process not only provided a signed statement for enforcement purposes, if necessary, but also provided the means to monitor reporting compliance and track quotas.

Throughout the year, 147,491 transactions were entered into the SAFIS database, covering over 320,828 individual species landings. Federal-reporting dealers submitted 76% of these transactions electronically. Of the remaining transactions submitted by state-reporting dealers, one-third was entered electronically by dealers, and two-thirds were submitted on paper-based forms. The latter were either keypunched by project staff or uploaded through the SAFIS file upload module.

Total landings (in whole pounds), as reported through both the SAFIS database and other federal reporting programs, amounted to 630 million pounds, valued at \$514 million (ex-vessel). The top five species in order of value were sea scallop, American lobster, Atlantic surf clam, Eastern oyster, and haddock, totaling \$382 million, or 74% of the total. When grouped together, offshore shellfish (sea scallop, surf clam, and ocean quahog), make up 58% of the total value landed in Massachusetts, whereas inshore and intertidal landings of shellfish, such as soft shell clam, northern quahog, blue mussel and oyster amounted to just under 6% of total value landed. Landings of invertebrate species (lobster, crabs, and whelk) amounted to 33 million pounds, valued at \$85 million, or 17%. All finfish landings, including both pelagic and benthic species, made up 20% of the total value, with groundfish species amounting to 14% of the total value. Landed species with an individual gross

value over \$2 million are shown in [Table 1](#); in aggregate, these species account for approximately 95% of the total value of all species landed.

Table 1. 2014 Massachusetts Landed Species with Value Greater than \$2 Million.

Species	Landings (whole pounds)	Value
Sea Scallop	178,104,884	\$271,382,646
American Lobster	15,319,924	\$68,250,691
Surf Clam	101,744,471	\$16,764,967
Eastern Oyster	6,102,181	\$15,680,692
Haddock	9,743,664	\$10,353,529
Goosefish	10,523,034	\$9,939,554
Ocean Quahog	110,728,839	\$9,813,936
Atlantic Herring	78,048,111	\$9,252,553
Jonah Crab	11,943,076	\$9,086,915
Atlantic Cod	4,296,171	\$7,482,170
Winter Flounder	3,818,450	\$7,381,305
Pollock	7,071,851	\$7,019,224
Silver Hake (Whiting)	8,462,482	\$5,857,954
Redfish	9,505,852	\$5,115,264
Striped Bass	1,138,507	\$4,748,978
White Hake	3,303,968	\$4,475,163
Channeled Whelk	1,887,048	\$4,353,607
American Plaice (Dab)	2,389,984	\$3,928,664
Softshell Clam	1,924,619	\$3,686,808
Northern Quahog	5,354,370	\$3,660,388
Winter Skate	8,793,182	\$2,894,980
Witch Flounder (Gray Sole)	1,083,287	\$2,677,000
Summer Flounder (Fluke)	696,029	\$2,516,719
Yellowtail Flounder	2,336,668	\$2,408,449
Bay Scallop	888,066	\$2,370,848
Longfin Squid	2,433,866	\$2,274,454
Atlantic Mackerel	10,859,371	\$2,168,180

Source: ACCSP Data Warehouse, as of April 22, 2015.

Certain fisheries are managed by quota in Massachusetts and were monitored in 2014 using the dealer reported landings in the SAFIS database. Automated scripts ran on a nightly basis and were displayed on both the *Marine Fisheries* Internet website ([Figure 12](#)) as well as the internal Statistics Project Intranet website. On a weekly basis during the open season, staff reviewed compliance, by species, from dealers which had already purchased during the year, or in past years, and accounted for potential landings if the dealer did not yet report. A regression analysis was run at least once per week for each fishery still open, the results of which were used to estimate a closure date. Any overages were applied to the following year's total harvest.

QUOTA MANAGED SPECIES 2014 Landings and Quota Information as of Feb 13, 2015 - 07:09 A.M.				
Species	2014 MA Landings	2014 Quota	Quota Type	Percent Landed
Black Sea Bass	279,205	282,100	MA	99.0%
Bluefish	471,468	545,970	MA	86.4%
Dogfish	9,392,912	28,634,600	CW	to NMFS
Fluke	694,114	688,593	MA	100.8%
Horseshoe Crab*	117,349	165,000	MA	71.1%
Menhaden	2,218,570	3,126,019	MA	71.0%
Scup (Winter I)	194,097	9,900,931	CW	to NMFS
Scup (Summer)	953,173	1,845,207	MA	51.7%
Scup (Winter II)	64,024	3,498,387	CW	to NMFS
Striped Bass	1,138,507	1,155,100	MA	98.6%
Tautog	63,446	53,350	MA	118.9%

MA = Massachusetts-specific quota

CW = Coast-wide quota shared between MA and other Atlantic states prompt

*Horseshoe Crab quota and landings reported as count of individual crabs harvested for non-biomedical purposes.

Figure 12. Example display of quota monitoring data available on *MarineFisheries'* website.

Fisherman Catch and Effort Data Collection

Since 2010, all commercial fishermen have submitted, on a monthly basis, comprehensive, standardized trip-level data for all commercial trips conducted under the authority of a Massachusetts commercial permit. Those individuals holding a federal permit with reporting requirements to NMFS (e.g., Vessel Trip Report or VTR), were exempt from reporting to *MarineFisheries* for those activities occurring on their federally-permitted vessel. All other individuals were required to report to *MarineFisheries*.

This change eliminated the suite of species- and gear-specific annual catch reports that were collected for years, some since the late 1960s, and has greatly enhanced the agency's capabilities to monitor catch and effort information in all commercial fisheries conducted by Massachusetts commercial fishermen. It also meets the interstate standards promoted by ASMFC through ACCSP.

Fishermen either submitted their trip-level reports in paper form or on-line using the SAFIS eTrips application, a web-based program developed jointly by ACCSP staff and program partners. Project staff used the same application or a bulk upload process called eTrips upload to enter data submitted on paper forms. Thus, the primary repository for all trip-level data, except those reported to NOAA fisheries, is the SAFIS database.

Grant support provided by ACCSP to help fund the cost of data entry services brought on by the trip-level program ended in October 2014. The grant stipulated that ACCSP receive all trip-level data submitted to *MarineFisheries*. Making SAFIS the primary repository fulfilled this requirement and met the needs of the Fisheries Statistics Project as data can easily be downloaded from the SAFIS database to be used for compliance and fisheries analysis.

In 2014, *MarineFisheries* issued 7,338 commercial harvester permits, of which 15% were for federal reporting vessels. The remaining 6,200 commercial permits were designated as "state-reporting", 25% of which reported electronically using the SAFIS eTrips application, representing a slight uptick in electronic reporting participation. This left 60% of harvesters submitting paper reports to *MarineFisheries*. Of the 110,686 commercial trips that occurred in 2014 that were entered in the

SAFIS database, approximately 26% were entered by commercial permit holders using the SAFIS eTrips application, with the remaining trips entered by *Marine Fisheries* staff.

Data Analysis and Dissemination

Project staff provided a wide variety of data and technical support during 2014. Significant time was dedicated to ensuring correct harvester reporting methods and compliance during the permit renewal period. Considerable effort was also devoted to completing both the five year update of the Massachusetts Ocean Plan important commercial fisheries activity areas and the 2014 Lobster Stock Assessment. Analyst Brant McAfee left the agency mid-year, and before he left, considerable time was spent documenting some of the more important procedures and systems developed during his tenure. His position was filled later in the year by Erich Druskat, and much of the latter portion of the year involved bringing him up to speed in that position. Several major projects are described below in more detail.

Buoy Line Analysis: Supplemental data collected from fishermen at the time of permit renewal were analyzed to estimate the quantity and distribution of buoy lines associated with fixed fishing gear deployed in Massachusetts waters. Considerable time was required to reorganize the data as the analysis was last completed five years ago using a different survey; this facilitated an enhanced examination of buoy lines by area and month. Results were used by *Marine Fisheries* for several purposes, including marine mammal management issues and inclusion in a turtle entanglement study. Staff planned to review the survey's design prior to its next use to improve the quality of responses.

Striped Bass Tagging Program: As this was the first year of a dealer-based tagging program mandated by ASMFC, Project staff built new routines to analyze estimated tag requirements by dealers for 2014 based on a two-year average, and then distribute the tags (with sequential tag numbers) in multiples of 20. At the end of the season, returned tags were recorded and any discrepancies identified.

Ocean Quahog & Surf Clam Fishery Data: Project staff initiated an extensive project to pull ocean quahog and surf clam harvester data from the NOAA Fisheries database to combine with both VTR and state reported harvester data. This has been a longtime goal and not possible until recently as data from these two ITQ (individual transferable quota) managed fisheries, which rank highly in both landings and value in Massachusetts, have not been readily available. The hope is that the information can be incorporated with the other data sets to provide a complete picture of all fisheries in the Commonwealth.

Cultured vs. Wild Caught Shellfish: Working with the Shellfish Program, Project staff initiated a significant effort to monitor and reconcile data entered both by dealers and harvesters to differentiate between wild caught and cultured shellfish. Changes were made recently to the SAFIS database to include a new "CATCH_SOURCE" field which can be used to track cultured shellfish (or potentially other products). This new database field will be instrumental in tracking all cultured fisheries in Massachusetts, especially the expanding oyster fishery.

ACCSP Participation and Planning

Marine Fisheries staff continued to participate on all partner-based committees within ACCSP, particularly as *Marine Fisheries* relies more and more on the services provided. Staff provide technical advice in areas such as data quality and standards, application design, outreach, and

Program policies, particularly with regard to addressing issues presented in an Independent Program Review conducted two years ago.

Swipe Card Pilot Project: 2014 also marked the beginning of a new pilot project, working together with and partially funded through ACCSP, to build a pilot swipe card transaction system in Massachusetts for shellfish buyers. The swipe card is intended to electronically capture all required attributes of a primary transaction both from the dealer and harvester at the trip level in a single ticket which is then submitted directly into the SAFIS database.

The concept is that at the time of the transaction, the permit holder would present the transaction card associated with the permit, on which is stored information about the permit holder and vessel. The dealer would read the information from the card, using a card reader attached to any number of devices (mobile, tablet or desktop), thereby populating the information in the transaction automatically without requiring the dealer to choose both the permit holder and vessel from a pick list, or enter it manually which is prone to error. The dealer would record all attributes about the transaction, including species (for all species purchased), quantity and price, as well as those typically provided by the harvester on a separate report, such as area fished and gear used. Once the transaction is completed, it would be sent directly to ACCSP and inserted into the SAFIS database.

Initially, this project would start the process of creating a single ticket commercial data collection system in Massachusetts, for shellfish dealers only, where dealers collect and submit all information about the commercial trip. This would eliminate the cost of data entry for reports submitted by commercial harvesters who sell to these dealers, and it would eliminate the burden on these harvesters to report. It would increase the burden on dealers to collect the additional data attributes submitted by harvesters now, but, at least in the shellfish industry, these would be minimal, as area fished is already required to be reported by dealers for public health reasons. All data would continue to be entered into the SAFIS database, as it has since 2010, and furthermore, it would be submitted immediately at transaction time, rather than a month (or longer) afterwards. There would no longer be a need to reconcile differences that occur in a two-ticket system, and with certain information stored on the transaction card, the accuracy of the data submission is enhanced.

Looking beyond the immediate benefits, this technology could potentially be expanded to other fisheries in Massachusetts, and other ACCSP partners could take advantage of it, or similar technology. Other long term benefits include greatly enhanced law enforcement capabilities, as a completed transaction could be available to law enforcement officers through special access to the SAFIS database, assuming confidentiality issues are addressed, as soon as it has been committed to the database. In addition, if other data attributes can be collected at the point of sale for the purpose of meeting requirements for Public Health, then the consolidation of common reporting requirements would be a benefit to all parties involved. Furthermore, if all primary transactions (for all species) were collected in this fashion at some point, the information could potentially be used to electronically trace seafood through the distribution chain.

As of the end of the year, a software contractor (HarborLight Software) was hired and fact-finding and verification of requirements began. Several shellfish dealers were also recruited to participate in the pilot. The team intended to begin testing of the software in early June 2015 with these dealers.

SHELLFISH AND HABITAT SECTION

J. Michael Hickey, Section Leader

Shellfish Sanitation and Management Program

Personnel

J. Michael Hickey, Program Manager

North Shore Field Station

Jeff Kennedy, Project Leader, Shellfish Purification Plant Manager

Jack Schwartz, NPDES-Contaminants Coordinator

Florence Cenci, Laboratory Supervisor

Gregory Bettencourt, Biologist

Melissa Campbell, Assistant Biologist

Glenn Casey, Biologist

Ashley Lawson, Bacteriologist

David Roach Jr., Biologist

Devon Winkler, Biologist

Newburyport Shellfish Purification Plan

Diane Regan, Laboratory Supervisor

Ralph Stevens Jr., Plant Foreman

Albert Thistlewood, Assistant Plant Foreman

Richard Hardy, Laborer

Peter Kimball, Laborer

Paul Thistlewood, Laborer

New Bedford Field Station

Thomas Shields, Project Leader, Hughes Hatchery Acting Manager

Susan Boehler, Laboratory Supervisor

Neil Churchill, Biologist

Kelly Kleister, Biologist

John Mendes, Biologist

Jerry Moles, Biologist

Terry O'Neil, Biologist

Jim Rossignol, Assistant Biologist

Gregory Sawyer, Biologist

Christopher Schillaci, Vibrio Coordinator

Overview

The Shellfish Sanitation and Management Program (Shellfish Program) focuses on public health protection, as well as the direct and indirect management of the Commonwealth's molluscan shellfish resources. Public health protection is ensured through the sanitary classification and the monitoring of marine biotoxins within waters under the jurisdiction of the Commonwealth.

Nationally, the harvest and handling of all bivalve molluscan shellfish is regulated by the National Shellfish Sanitation Program (NSSP). The NSSP was established in 1925 by the United States Public Health Service for the harvest and handling of shellfish in interstate commerce for human consumption. The NSSP “Guide” is developed and administered today by the United States Food and Drug Administration (USFDA) and the Interstate Shellfish Sanitation Conference (ISSC), a federal/state cooperative. Massachusetts is a voting member of the ISSC.

Shellfisheries management is accomplished by direct *Marine Fisheries* regulation of the commercial surf clam, ocean quahog, and quahog dredge boat fisheries. In addition, regulations cover the harvest of contaminated shellfish for depuration and relay, and establish size, trip limit, and season for many shellfish species. *Marine Fisheries* regulates commercial shellfish aquaculture and is required to certify that operation of private shellfish aquaculture projects at sites licensed by coastal municipalities will not have an adverse impact on shellfish or other natural resources of the city or town. Indirectly, *Marine Fisheries* manages shellfish resources through its partnership with the coastal communities by providing technical assistance to local management authorities in the development of management plans and local regulations for control and conservation.

Sanitation – Public Health Protection Project

Shellfish Growing Area Classification

Surveys: Public health protection is accomplished with the use of sanitary surveys to determine a shellfish growing area’s suitability as a source of shellfish for human consumption. Sanitary surveys include: 1) identification and evaluation of all actual and potential pollution sources which may affect a shellfish growing area; 2) evaluation of hydrographic and meteorological characteristics that may affect distribution of pollutants; and 3) assessment of overlying water quality. Each shellfish growing area must have a complete sanitary survey every 12 years, a triennial evaluation, as well as an annual evaluation report to maintain a classification allowing shellfish harvesting. Minimum requirements are set by the *NSSP Guide for the Control of Molluscan Shellfish*.

To satisfy NSSP requirements in 2014, Shellfish Program staff biologists completed 302 annual evaluation reports, 34 triennial evaluations, and 36 sanitary survey reports. Twenty-three conditional area/rainfall management plans were re-evaluated. See [Table 2](#) for a summary of associated sampling activity. All water samples were analyzed for fecal coliform bacteria at either the *Marine Fisheries* shellfish laboratory in Gloucester or New Bedford using the mTEC method. Additional sampling activity for other responsibilities is included in the table.

Table 2. Summary of 2014 Sampling Activity.

	Gloucester Lab	New Bedford Lab	Total
# of Water Samples	2,837	6,844	9,681
# of Shellfish Growing Areas Sampled	22	232	254
# of Classification Station Water Samples	2,647	6,557	9,204
# of Pollution Source Water Samples	144	230	374
# of Ad-hoc Water Samples	46	57	103
# of Shellfish Meat Samples	2	38	40
# of <i>Vibrio</i> Oyster Samples	-	36	36
# of Classification Areas Sampled	107	390	497
# of Cities/Towns Sampled	21	43	64

The USFDA annually reviews *Marine Fisheries*' shellfish growing area files for compliance with the NSSP standards for minimum sampling frequency, completion of required growing area reports, conditional area management plan updates, and conformity with appropriate classification area water quality criteria requirements. USFDA concluded Massachusetts remained in compliance with the NSSP during 2014.

Classifications: The NSSP defines five area classification schemes:

1. **APPROVED:** Open to shellfish harvesting for direct human consumption subject to local rules and regulations. Closed only during major coast-wide events (e.g., hurricane, oil spill or red tide event).
2. **CONDITIONALLY APPROVED:** Closed some of the time due to rainfall or seasonally poor water quality or other predictable events. When open, it is treated as an Approved area.
3. **RESTRICTED:** Contains a limited degree of contamination at all times. When open, shellfish can be relayed to a less contaminated area or harvested for depuration.
4. **CONDITIONALLY RESTRICTED:** Contains a limited degree of contamination at all times, subject to intermittent pollution events and may be closed some of the time due to rainfall or seasonally poor water quality. In Massachusetts, when open, only softshell clams may be harvested by Master/Subordinate Diggers for depuration at the *Marine Fisheries* Shellfish Purification Plant.
5. **PROHIBITED:** Closed to the harvest of shellfish under all conditions, except the gathering of seed for municipal propagation programs under a *Marine Fisheries* permit.

Massachusetts utilizes all five classifications. Overall in 2014, Massachusetts saw a small net gain in "open" shellfish areas, with an increase in APPROVED and CONDITIONALLY APPROVED areas of 307 acres and a corresponding decrease in RESTRICTED and PROHIBITED acreage with no change in CONDITIONALLY RESTRICTED areas (Table 3). Changes occurred in areas CCB42, NT9, V31, BB4, BB43, and BB44 (described below). A new growing area was created when V15 was split into V15 (Farm Pond, Oak Bluffs) and V36 (Harthaven Harbor, Oak Bluffs), with no change in classification. See Figure 13 for the status of classifications coastwide at the end of 2014.

Table 3. Change in Massachusetts shellfish growing area classification, 2013 to 2014.

Area Classification	Acreage		
	2013	2014	Change
Approved	1,444,829	1 445,133	304
Conditionally Approved	25,285	25,288	3
Restricted	2,992	2,929	-63
Conditionally Restricted	5,086	5,086	0
Prohibited	266,607	266,363	-244

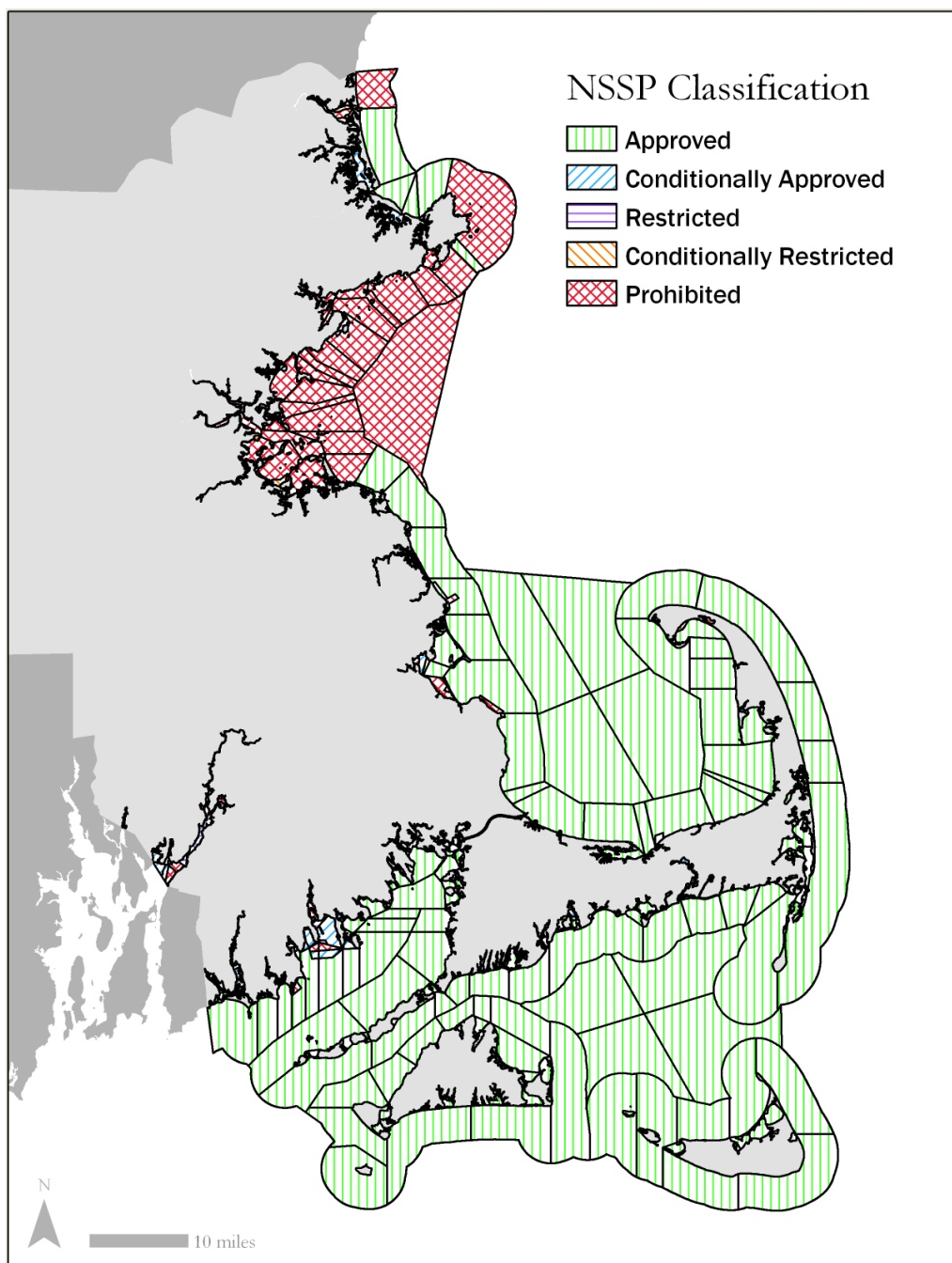


Figure 13. NISP classification map of MA shellfish growing areas as of December 31, 2014.

Within Plymouth Harbor (CCB42), nearly 4,000 acres were opened to recreational shellfishing. Based on water quality improvements resulting from a waste water treatment plant upgrade, a small portion of the harbor along Long Beach was able to be reclassified and upgraded from PROHIBITED to APPROVED. The Harbor has been closed to shellfishing for at least 40 years. As of October 2014, this new area, which has been absorbed into CCB42.0, has been open to shellfishing. Shellfish species in this area include softshell clams, oysters, razor clams, quahogs, and blue mussels.

On Nantucket, 278 acres within Sesachacha Pond (NT9) were reclassified upward from PROHIBITED to RESTRICTED in May. This growing area was reclassified at the request of the town. A number of homes along the northern section of the pond had septic system improvements. The area had been PROHIBITED since 1988. Although recreational and commercial shellfishing is still prohibited within the pond, the reclassified area can be utilized by the town to culture oysters under a municipal propagation permit for later out-planting within APPROVED waters in support of public fisheries.

On Martha's Vineyard, a 66-acre portion of Tisbury Great pond (V31) was reclassified and upgraded from CONDITIONALLY APPROVED to APPROVED. Additionally, a 4.8-acre portion of the pond was reclassified from PROHIBITED to APPROVED.

In Buzzard's Bay, there were a number of classification changes. The CONDITIONALLY APPROVED waters of the East Branch of the Westport River (BB4.15) were enlarged by 64 acres. The classification of the upper reaches of the East Branch (BB4.2) was reclassified from RESTRICTED to PROHIBITED. A half-acre portion of Fisherman Cove (BB43.5) in Wareham was reclassified upward from PROHIBITED to APPROVED. A 2.1 acre portion of Buttermilk Bay in Wareham (BB44.14) was reclassified from APPROVED to CONDITIONALLY APPROVED.

At the end of the year, program biologists continued to re-evaluate Lynn Harbor, Saugus River, Nahant Causeway, the Gravel Guerties in Pines River, Ipswich River areas, and upper Essex River.

Notification: A legal notice is required by *Marine Fisheries* for each change in a shellfish growing area's classification or status. These notices reflect the type of opening or closure, the dates, the reason, and other pertinent descriptive information. Copies are sent to municipal managers, the state Office of Law Enforcement (OLE), Massachusetts Department of Public Health (*MassDPH*), USDA, and other interested parties. In 2014, 552 legal notices were generated by Shellfish Program staff and distributed for sanitary reclassification and rainfall closures/re-openings. Additional notices were prepared for paralytic shellfish poisoning events (n=6) and vibrio events (n=2).

Pollution Discharge and Contaminant Assessment

Program biologists also comment and make recommendations regarding United States Environmental Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) Permits. In 2014, 25 permits required review, including 20 point source discharges from waste water treatment plants and industrial discharges, and an EPA vessel discharge general permit. The remaining five permits involved the intake and discharge of non-contact cooling water. The review of public health consequences and environmental impact on shellfish growing areas was provided when associated with waste water treatment plant failures. Direct consultation with EPA and the Massachusetts Department of Environmental Protection (*MassDEP*) was provided to resolve issues raised by shellfish staff before issuance of final permits. Recommendations and comments involved end-of-pipe fecal coliform bacteria standards and facility chlorination requirements, along with impacts associated with other industrial discharges. Ongoing monitoring of a desalination plant was reviewed as requested by the Water Resources Commission and the Executive Office of Energy and Environmental Affairs.

Staff biologists also conducted assessments of chemical contaminants in fisheries resources. Contaminant information and data were identified and researched, and recommendations were provided to *Marine Fisheries* senior staff to inform management decisions. This included the review of a recent USDA determination on seafood safety supporting increased fish consumption, and new joint USDA-EPA fish advice. Updated mercury data for fish were assessed to inform and advise

the Director. EPA permitting requirements under CAFO (confined animal feed operation) were evaluated for the shellfish program. Contributions of editorial revisions for a fact sheet and shellfish field sampling services were provided to the Gulfwatch contaminant monitoring program of the Gulf of Maine Council. The Final Bouchard Oil Spill restoration program plan was reviewed for the shellfish program to identify restoration projects approved for funding and development.

PSP Monitoring

A major aspect of the shellfish program is monitoring for naturally occurring marine biotoxins produced by microscopic algae of the *Alexandrium* genus that can cause paralytic shellfish poisoning (PSP) or “red tide”. Consumption of shellfish containing certain levels of PSP toxin can cause severe illness and even death. Shellfish Program personnel collect shellfish from 13 primary stations weekly from March through October. Samples are analyzed at the *Marine Fisheries* Gloucester lab where bioassays determine the levels of toxin in shellfish (Figure 14). If toxin is found, both the frequency of sampling and the number of sample sites are increased. Shellfish areas are closed if toxin levels exceed safe limits.

A total of 433 state shellfish samples were processed through the Gloucester Shellfish Laboratory for PSP during calendar year 2014. The majority were the indicator species blue mussel *Mytilus edulis* (n=408), but also sampled were: softshell clam, *Mya arenaria* (n=18); razor clam, *Ensis directis* (n=3); and surf clam *Spisula solidissima* (n=4). As part of the agreement between MassDPH, *Marine Fisheries*, and NMFS, the Gloucester lab also analyzed 43 samples collected from the offshore surf clam fishery, consisting of 28 whole clams and 15 clam homogenate samples.

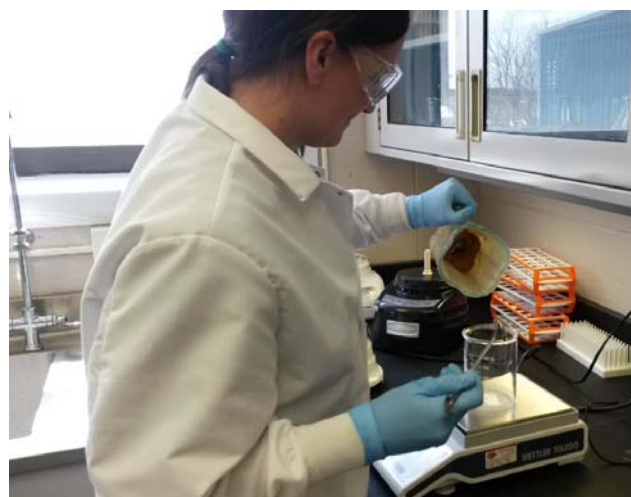


Figure 14. Assistant Biologist Melissa Campbell at work in the PSP extraction lab.

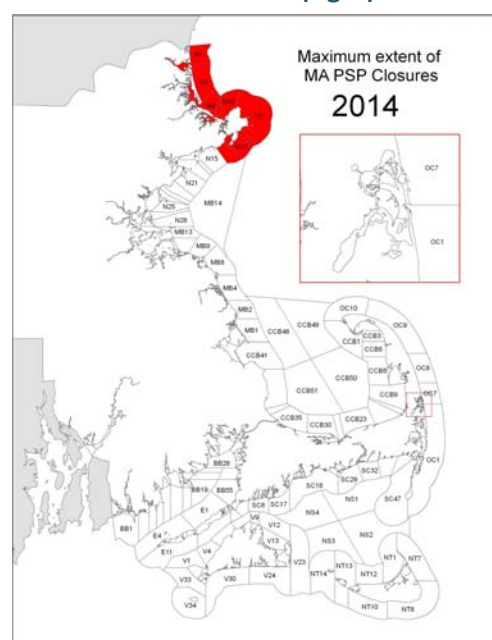
The 2014 PSP sampling season began on March 16 with blue mussels from several stations within the Nauset Estuary System (OC3, OC5, OC6). Sampling for all primary stations began April 14, continuing for 27 weeks, through October 20.

Only 6% of samples (24 out of 391) exhibited toxicity; these came from four primary stations: Annisquam Yacht Club, Gloucester (N9); Conomo Point, Essex (N7); Pavillion Beach, Ipswich (N4); and Plum Island Point, Newburyport (N2). Only three of those stations (N4, N7, N9) had toxicity above the closure levels of 80 µg/100g. Closure levels of toxicity in softshell clams were reached only at Gloucester. See Table 4 for resulting closures. During 2014, there were no reported illnesses due to red tide in Massachusetts or attributed to Massachusetts shellfish in interstate commerce.

None of the other nine state primary sampling sites displayed toxicity above the detection limit (~40 µg/100g). Of note, no toxicity was observed in the Nauset system. This is the first time since 2004 that toxicity has been absent in Nauset.

Table 4. 2014 PSP Closure Durations (left) and Maximum Extent of PSP Closures (right).

Growing Area	Days Closed			
	Blue mussel	Razor clam	Softshell clam	Surf clam
N1	32	30	30	101
N2	32	30	NA	101
N3	32	30	30	101
N4	32	15	15	101
N5	32	30	30	101
N6	32	30	30	101
N7	32	15	15	101
N8	32	30	30	101
N9	32	28	28	101
N10	32	30	30	101
N11	32	30	30	101
N12	32	30	30	101
N13	32	30	30	101
N14	32	30	30	101



On two occasions, in July and August, samples of Whole/Roe-on Sea Scallops and Whelks were collected from an offshore fishing vessel in Chatham, processed and shipped to the FDA lab in College Park, Maryland for PSP analysis in an effort to allow for opening of closed areas in offshore federal waters.

In 2014, 28 whole surf clam samples and 15 homogenate samples were analyzed for PSP in accordance with the DPH Dockside Protocol MOA. All samples were negative.

Phytoplankton Monitoring

Monitoring for other potentially toxic phytoplankton species blooms co-occurs with PSP sampling. In 2014, 173 phytoplankton samples were collected statewide.

On the South Shore, project biologists collected phytoplankton samples weekly from eight stations in Cohasset, Scituate, Plymouth, Sandwich, Wellfleet, Orleans and Falmouth (2). A total of 99 samples were analyzed qualitatively for relative abundance of potentially toxic species. No species of concern was observed in actionable levels.

On the North Shore, project biologists collected phytoplankton samples at least once a week at primary stations in Newburyport, Ipswich, Essex, and Gloucester. Sampling was conducted semi-weekly in Essex Bay and Annisquam River from late April throughout the bloom. Additional samples were taken in Lynn Harbor and at Deer Island on June 6 to determine the extent of the bloom. A total of 74 samples were analyzed.

Additional phytoplankton tows were performed in several embayments in Buzzards Bay and along the south shore of Cape Cod in response to reported visible plankton blooms. In each of these cases *Cochlodinium sp.* was identified as the source of the bloom. Reports of these often dramatic rust colored blooms have become commonplace along the southern Massachusetts coast from Rhode

Island northward into Cape Cod Bay, including on the islands of Martha's Vineyard and Nantucket, during the warm summer months.

Shellfisheries Management Project

Contaminated Shellfish Resources

Marine Fisheries directly manages the contaminated shellfish resources for commercial bait harvest, relay, and depuration.

Commercial Bait Harvest: In 2014, 14 dredge boat permits were issued for the contaminated surf clam bait fishery off Nantasket Beach in Hull. Due to confidentiality restrictions, landing statistics for this small fishery cannot be reported for this period.

Relaying: *Marine Fisheries* permits municipalities to relocate, between and within communities, bacterially contaminated shellfish to Approved and Conditionally Approved waters for natural purification and propagation. Relays are conducted under strict NSSP guidelines and are heavily supervised by state and local enforcement authorities. The Division requires that relocated shellfish remain in the water through at least one spawning season. Contaminated shellfish must remain at the transplant site until at least September 15 if relocated by June 15. If the shellfish are relayed after June 15, the shellfish must remain in the transplant site until at least the following September 15. No shellfish can be harvested until a bacterial test has been completed on each lot. Quahogs are the most frequently relayed species followed by oysters.

Disease monitoring was conducted in the Taunton River in late February 2014. The samples were sent to Kennebec Marine Biosciences in Maine for analysis. Approximately three weeks later, results were received with all three samples negative.

Three dredge boats were permitted to commence relaying in mid April. The majority of the shellfish relayed was completed by June 15 except for Westport, Falmouth, Edgartown, Swansea, New Bedford, and Fairhaven. The three boats relayed a total 13,079 bushels of quahog to 13 coastal communities. An additional 470 bushels of oysters were relayed within the towns of Falmouth and West Tisbury. A total of 29 areas received shellfish in the 15 towns which participated in the program. See [Tables 5 and 6](#).

Table 5. 2014 Contaminated Quahog Relays.

Town	Harvest Site	Transplant Site	Area	Bushels	Last Day Planted
Swansea	Taunton R.	Coles River (Pearce Road)	MHB:4	500	15-Jun
Swansea	Taunton R.	Lee River (Route 103)	MHB:3	635	15-Jun
Yarmouth	Taunton R.	Lewis Pond	SC:30	1,200	21-May
Barnstable	Taunton R.	Cotuit Bay (Main Street)	SC:21	500	10-Jun
Barnstable	Taunton R.	Cotuit Bay (Cordwood)	SC:21	602	13-Jun
Barnstable	Taunton R.	North Bay (Sand Point)	SC:23	176	9-Jun
Westport	Taunton R.	W. Branch (BB:3.19)	BB:3	885	15-Jun
Westport	Taunton R.	W. Branch (BB:3.12)	BB:3	885	15-Jun
Westport	Taunton R.	E. Branch (Halfmoon Flat)	BB:4	1,211	2-Jun
Westport	Taunton R.	Ram Island	BB:4	1,662	10-Sep
Westport	Taunton R.	E. Branch (S.W. of Speak. Rock)	BB:4	573	2-Jul
Bourne	Taunton R.	Phinney's Hbr (Mo. Beach)	BB:46	496	23-May
Bourne	Taunton R.	Phinney's Hbr (Little Bay)	BB:46	474	14-May
Bourne	Taunton R.	Red Brook (Winsor Cove)	BB:49	103	25-May
Eastham	Taunton R.	Salt Pond	OC:6	207	21-May
Eastham	Taunton R.	Town Cove	OC:4	193	23-May
Dennis	Taunton R.	Grand Cove	SC:34	250	13-Jun
Provincetown	Taunton R.	Breakwater	CCB:5	270	12-Jun
Truro	Taunton R.	Pamett Harbor	CCB:7	214	5-Jun
Sandwich	Taunton R.	Sandwich Harbor	CCB:37	300	5-Jun
Edgartown	Taunton R.	Katama Bay	V:20	336	30-Sep
West Tisbury	Tisbury Great Pond	Tisbury Great Pond	V:31	150	24-May
Swansea	Taunton R.	Coles River (Zone 2)	MHB:4	425	17-Oct
Swansea	Taunton R.	North of Route 103	MHB:4	400	17-Oct
New Bedford	Taunton R.	New Bedford Outer Harbor	BB:15	238	30-Oct
Fairhaven	Taunton R.	Round Cove	BB:18	344	25-Oct

Table 6. 2014 Contaminated Oyster Relays.

Town	Harvest Site	Transplant Site	Area	Bushels	Last day Planted
Falmouth	Little Pond	West Falmouth Harbor	BB:54	93	6-Nov
Falmouth	Little Pond	Quisett Harbor	BB:58	81	14-Nov
Falmouth	Little Pond	Green Pond	SC:12	146	21-Oct
West Tisbury	Tisbury Great Pond	Tisbury Great Pond	V:31	150	24-May

Depuration: *Marine Fisheries* has operated the Shellfish Purification Plant in Newburyport since 1961. The commercial harvest of mildly contaminated soft-shell clams (*Mya arenaria*) is made possible through depuration at the plant. During the purification process, seawater is used to flush pathogens (disease-causing bacteria) out of the shellfish, making them safe for market. The management and oversight of this process is a sizeable and critical activity for *Marine Fisheries*.

Clams are harvested from *Conditionally Restricted* areas in Boston Harbor, the Pines River in Revere and Saugus, and the Merrimack River in Newburyport and Salisbury, and then transported by licensed and bonded Master Diggers under strict enforcement to the Shellfish Purification Plant. The plant has nine depuration raceways which are filled with seawater from two 130-foot deep wells; the water is maintained at a constant temperature and salinity and is continuously disinfected with ultraviolet light. Each raceway can hold 108 dealer bushels/racks of clams. The depuration process is typically three days, during which analysis of shellfish and tank water is accomplished by daily testing in the on-site certified laboratory. Upon completion, the clams are returned to the harvesters who pay a depuration fee. The purified clams are then sold into commerce.

During 2014, the plant received shellfish on 127 days, comprising 198 lots (down from 153 days and 219 lots the previous year). In terms of racks, depuration landings declined 30% from 2013 largely due to the decline in harvest days. Regardless, in 2014, conditionally restricted harvesting accounted for 6.8% of the 1.9 million pounds of Massachusetts landed softshell clams, which is a slight increase from the previous year. Overall, Massachusetts softshell clam landings declined 40% from 2013 to 2014. All lots met release criteria with no product recalls.

Four areas were harvested on 72 days in 2014 in Boston Harbor, all within the Town of Hull, accounting for 17% of depuration activity. The remaining 83% of plant production was for clams received from area N2.1 in Newburyport and Salisbury, and areas N26.1 and N26.4 in Revere and Saugus. The Pines River was harvested on 48 days, down from 96 days in 2013, while the Merrimack River was dug 78 times, up from 48. Shellfish growing area N2.1, the Merrimack River, produced 51% of all depuration harvested shellfish, up 80% from 2013.

Five Master Diggers delivered clams to the Purification Plant this year with 51 Subordinate Digger permits issued, down slightly from 54 permits in 2013. An average of six subordinate diggers harvested each digging area per tide.

Wet Storage

For 83 years, the Shellfish Purification Plant operated solely as a depuration facility. This changed in 2013, when the plant began a new service to Massachusetts wholesale shellfish dealers: wet storage processing. In wet storage, sterilized seawater is used to flush sand, mud, and grit out of shellfish harvested from NSSP-classified *Approved* areas. As these shellfish are already at safe bacterial level, the focus of wet storage is on enhancing them for market and extending the shelf-life. While there is no mandatory process time or microbiological testing like for depurated shellfish, wet stored shellfish are also regulated by the NSSP, overseen by *MassDPH* and *USFDA*, and must comply with strict controls and standards, like traceability.

In 2014, wet storage totals declined by 52% primarily due to a reduction in wholesale dealers utilizing the service. Shellfish Plant combined production of both wet storage and depuration accounts for 14% of state landings in 2014. It is anticipated that wet storage operations will grow in 2015, complementing depuration processing at the facility.

Shellfish Purification Plan and Laboratory

Laboratory Activities: The Shellfish Purification Plant's laboratory analyzed 474 shellfish samples and 630 water samples for the indicator bacteria, fecal coliform.

In 2014, laboratory staff participated and passed two proficiency evaluations: USFDA and the Northeast Laboratory Evaluation Officers and Managers (NELEOM). In May, the Laboratory Supervisor and the New Bedford Lab Supervisor began training for *Vibrio parahaemolyticus* (Vp) testing with newly-purchased equipment. In July, both staff received week-long training at USFDA Dauphin Island Laboratory in Alabama. In September, Plant lab staff along with Gloucester and New Bedford laboratory staff attended the five-day NELEOM meeting in New Bedford.

As part of fulfillment of a SeaGrant collaboration administered through the University of New Hampshire, softshell clams in plant production were analyzed in addition to local approved area shellfish for Male-specific Coliphage (MSC), a viral indicator, as part of a MSC validation study. In support of Shellfish Plant wet storage/desanding activities, the Laboratory Supervisor conducted sand removal quantification and condition index experiments on softshell clams, razor clams (*Ensis directus*) and surf clams (*Spisula solidissima*). Reductions were below equipment sensitivity. Staff collaborated with a University of New Hampshire researcher developing a custom razor clam rack for potential depuration processes. Several successful validation trials were completed at the plant with this system.

Education and Outreach:

Numerous informal tours were provided throughout the year including a class of 14 students from the Minuteman Regional Technical High School in March. In June the Lab Supervisor was 'shadowed' by a middle school student for a day. Both the Plant Foreman and Laboratory Supervisor hosted the annual Open House during Newburyport Yankee Homecoming distributing numerous *Marine Fisheries* and Shellfish Plant educational pamphlets and activity booklets (Figure 15).



Figure 15. Shellfish Plant Foreman Ralph Stevens explains depuration for visitors during an Open House.

Facility Maintenance: The Plant was inspected on a monthly basis by MassDPH Food Protection Program. There were no objectionable conditions noted on any reports in 2014. Plant maintenance and improvements continued with: an energy audit in January; the repair and replacement of the Plant drain line in February; replacement of both saltwater well submersible pumps in April; and energy efficiency upgrades in lighting and cooler recirculating fan motors. The plant also continued to supply seawater to local educators for their saltwater cultures, displays, and aquaria.

Boston Harbor Soft-Shell Clam Enhancement

2014 marked the ninth year in which the *Marine Fisheries* Shellfish Program conducted its Boston Harbor Softshell Clam Enhancement project. From July 17 through October 28, an estimated 500,000 juvenile clams (*Mya arenaria*) were planted within 55 plots at three sites on intertidal flats of Boston Harbor and surrounding communities (Figure 16 and 17). The clams were purchased from Salem State University's Northeastern Massachusetts Aquaculture Center (NEMAC) hatchery.

Standardized techniques were used for all procedures. The seed clams averaged about ½ inch in shell length and were planted roughly 30 per square foot. Enhancement plots were covered with nets to protect clams from predators. *Marine Fisheries* personnel monitored the enhancement plots regularly throughout the growing season to inspect for net fouling, tears, over-siltation or other impediments to clam growth and survival. An undergraduate student of Salem State University assisted in seed planting, sampling and measuring, and net removal. All nets were extracted from the enhancement sites starting in late December and continuing into January. Those with minor damage were repaired for reuse the subsequent year.

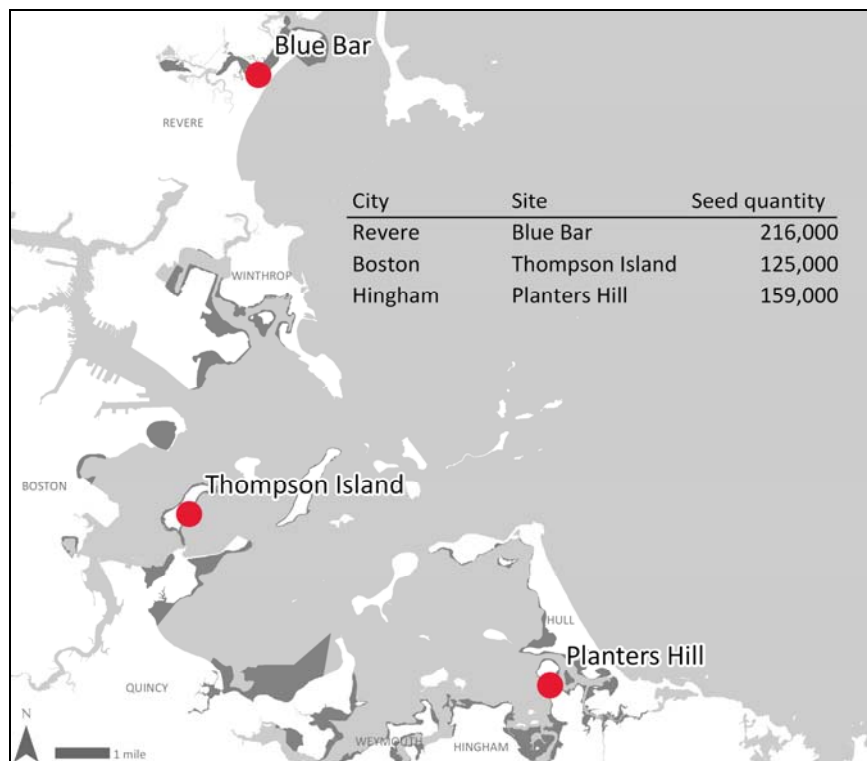


Figure 16. Location of enhancement sites with the total number of clams planted at each.

In order to assess how different enhancement sites compare against each other, shell lengths and a condition index were measured from the previous year's planted clams. Samples of around sixty clams were taken monthly from May through July at three 2013 sites: Blue Bar in the Pines River, Revere (Revere); Planters Hill at Worlds End, Hingham, on the Hingham Harbor side of a causeway (Hingham); and Planters Hill at Worlds End, Hingham, on the Weir River side (Hull).

Shell lengths are measured to determine whether a particular site allows the seed clams to attain the minimum harvestable size before the enhancement site is reopened to the diggers. Clam growth

can be impacted by many factors, including food availability, salinity, temperature, and sediment size. Both the Revere and Hingham sites are composed mainly of sand, which promotes quick growth and clams develop into a long and narrow shape. The Hull site contains larger, coarser sediments that slow clam growth and result in a more short and round-shaped clam. This is evidenced by comparing the growth rates at the three sites: where Hingham and Revere averaged seven and ten millimeters per month respectively, Hull attained monthly growth of only five millimeters.

Condition indices are basically a ratio of the clam tissue to its shell. They are useful in determining if the animals are experiencing stress, whether through physical environmental factors, predation or disease. The enhancement project uses condition index as a proxy measurement for determining if the site is a stress-free and nutritive environment for the planted clams. Determining which factor is causing a change in the clam condition index is difficult, as it varies with season as a clam ripens and spawns, and can be influenced by a large multitude of measures. However, comparing relative changes in sites throughout a season can be informative of the overall health of the clams and the suitability of the location. Indeed, this was apparent in Revere, as a downward trend of the condition index was sharply contrasted by an increase in both the Hingham and Hull sites. This decrease was a harbinger of a large die-off event at the Revere site; such a large number of the planted clams succumbed to a disease (presumably hematopoietic neoplasia) that obtaining a future sample was impossible. Barring disease, this site is well suited for enhancement; in previous years, Blue Bar had performed exceedingly well, with good clam growth and 2-year survivability as high as forty percent.

The enhancement project led its fourth year of outreach work with the Thompson Island Outward Bound Education Center in Boston Harbor. This educational initiative—consisting of three clam planting events—is aimed at teaching the participants about the important role softshell clams play in the ecology of the Boston Harbor mudflats and the local, state-wide and regional economies.



Figure 17. *Marine Fisheries* biologists Melissa Campbell and Devon Winkler seeding softshell clams.

Technical Assistance Project

In Massachusetts, cities and towns manage the shellfisheries in all waters within their boundaries not closed by *Marine Fisheries* for public health reasons. This includes all shellfisheries with the exception of commercial harvest of surf clams and ocean quahogs which remain under state control. The Shellfish Program assists municipalities on a wide variety of shellfisheries management issues providing technical and regulatory information as well as recommendations on numerous subjects to local shellfish managers. Assistance includes: shellfish propagation; predator control; survey methods; management openings and closures; habitat improvement; shellfish management plans; aquaculture development and regulation; water quality; public health and sanitation; and permitting. All shellfish staff provide technical assistance to municipal managers and boards, state and federal agencies, academia and non-governmental research and management organizations, and individuals. In 2014, New Bedford staff rendered technical assistance in 850 communications and Gloucester staff provided technical assistance in over 400 calls and emails.

Environmental Protection Activities

Shellfish Program personnel respond to pollution events in coastal waters in order to assess damage to shellfish populations and to determine the need for public health closures. These events include sewage discharges, boat sinkings, petrochemical spills, and other discharges of hazardous chemicals. Several pollution-related events in 2014 are detailed below.

- On July 4, Hurricane Arthur made landfall in New England causing high winds and extremely heavy rainfall, greater than 4 inches in most of the state. Due to the high amount of rain, *Marine Fisheries* closed the entire state to shellfishing. Many areas had to be sampled in order to be reopened. Most coastal areas were re-opened between July 5-8, and the last areas were re-opened on July 15.
- On September 9, a commercial fishing vessel out of Fairhaven pumped its bilge causing a 2.5-mile long oil sheen in upper Buzzards Bay. Shellfish Growing Areas BB1, BB5 - BB15 and E4 within the towns of Dartmouth, Fairhaven, Gosnold, New Bedford and Westport were closed. The last closed area was re-opened on September 15. The closure impacted commercial (24) and recreational (105) quahog and soft shell clam fishermen. A total of 80,394 acres of shellfish growing waters were closed due to the oil spill.
- On April 26, a portion of Onset Bay in Wareham (BB40.6) was closed due to a diesel spill at Point Independence Yacht Club. A total of 33 acres of shellfish growing area was closed for two days.
- On June 23, 750 acres of Widows Cove, Onset Bay, Sunset Cove and Fisherman's Cove in the towns of Wareham and Bourne (BB39-41 and BB43) were closed due to a sewage spill at Point Independence Yacht. The area was re-opened on June 25.
- Boston Harbor and the North Shore were impacted by 30 wastewater treatment plant or collection system events on 13 dates from January 11 to December 12. A total of 94.3 million gallons were discharged in 30 reportable events, with at least 80% due to rainfall events. These discharges closed nine shellfish growing areas for a total of 176 days of lost harvest in 2014.

In addition, the Shellfish Program co-reviews, with other *Marine Fisheries* staff, proposed coastal alteration projects for impacts on water quality, shellfish resource and habitat. Recommendations are provided through *Marine Fisheries* environmental review process to the permitting agencies concerning the effects of proposed structures, filling, and discharge to marine waters. In 2014, staff biologists reviewed a combined 187 project proposals.

Aquaculture Project

Permitting

The regulation of shellfish aquaculture is a major management and technical assistance endeavor of the Shellfish Program. This activity involves two areas of concern: licensing of sites by municipalities, and the permitting of aquaculturists to obtain and possess sub-legal shellfish (seed) for transplant and grow-out to legal size. *Marine Fisheries* assists the industry and municipalities by certifying (after inspection of the project site as required by Massachusetts General Law, Ch.130, Sec. 57) that license and operation will cause no adverse effect on shellfish or other natural resources of the city or town. The required *Marine Fisheries* permit is designed to allow possession of seed and to prevent the introduction of shellfish diseases, non-native species, and other pests or predators that could decimate natural populations and ruin both aquaculture and wild commercial fisheries.

In 2014, *Marine Fisheries* issued shellfish propagation permits to 367 aquaculture license site holders and municipalities (for public propagation activities) operating shellfish aquaculture projects in 28 coastal municipalities throughout the Commonwealth. A total of 351 permits were issued to strictly private/commercial shellfish aquaculturists. See [Table 7](#) for the number of shellfish propagation permits and acreage under cultivation by town.

Several notable aquaculture siting developments during the year are presented below.

- The Town of Plymouth added a 10-acre site in Saquish Harbor (CCB45), as well as two 4-acre sites and an 80-acre intertidal aquaculture development area in Plymouth Harbor (CCB42).
- The Town of Bourne added a 1-acre license off Tobey Island in Buzzards Bay (BB46).
- The Town of Eastham added a half-acre site to the aquaculture development area located off First Encounter Beach (CCB9) and a 1.5-acre extension to an existing lease in the Nauset Marsh system (OC5).
- The Town of Falmouth approved three licenses and a 7-acre extension in Megansett Harbor (BB50) and a 2-acre site just outside Rands Canal.
- Nantucket subdivided two 4-acre sites from the existing aquaculture development area located at the Head of the Harbor.
- The Town of Dartmouth approved a half-acre site in Apponagansett Bay (BB12).
- The Town of Edgartown added two 2-acre deep water sites on the Middle Flats area (V13).

Table 7. 2014 Shellfish Propagation Permits and Acreage Under Cultivation, by Town.

Town	# Growers	Total Acres	Species
Aquinnah	1	2.60	Quahog
Barnstable	52	138.76	Oyster, Quahog, Softshell Clam
Bourne	1	2.90	Oyster
Brewster	9	8.50	Oyster, Quahog
Chatham	2	8.00	Oyster, Quahog, Softshell Clam, Razor
Chilmark	8	23.06	Oyster, Blue Mussel
Dartmouth	1	0.50	Oyster
Dennis	28	30.00	Oyster, Quahog, Softshell Clam
Duxbury	29	70.66	Oyster, Quahog
Eastham	24	19.47	Oyster, Quahog, Softshell Clam, Mussel
Edgartown	12	15.50	Oyster
Fairhaven	2	36.00	Oyster, Quahog, Bay Scallop
Falmouth	9	40.10	Oyster, Mussel
Gosnold	1	32.00	Oyster
Ipswich	3	2.00	SS Clam
Kingston	3	8.50	Oyster
Marion	3	1.50	Oyster
Mashpee	4	13.90	Oyster, Quahog, Softshell Clam
Mattapoisett	2	104.90	Oyster, Bay Scallop
Nantucket	8	71.00	Oyster, Quahog, Softshell Clam
Oak Bluffs	1	2.00	Oyster
Orleans	19	23.28	Oyster, Quahog, Mussel, Surf Clam
Plymouth	8	35.37	Oyster, Quahog, Softshell Clam
Provincetown	8	14.00	Oyster, Quahog, Mussel, Surf Clam
Rowley	14	18.50	Oyster, Softshell Clam, Razor Clam
Truro	8	19.00	Oyster
Wareham	7	86.18	Oyster, Quahog
Wellfleet	90	259.10	Oyster, Quahog, Softshell Clam, Mussel, Razor Clam
Westport	3	3.00	Oyster, Quahog
Yarmouth	3	16.50	Oyster, Quahog
TOTAL	363	1,106.78	

Aquaculture Landings

Aquaculture landings for 2014, as derived from SAFIS dealer reports, are presented in [Table 8](#). For privacy reasons, municipalities with less than three growers or three wholesale dealers are grouped into general geographic area from where the landings originated. Additionally, species with less than three growers or wholesale dealers are grouped and only value is reported. Units for quantity are converted for reporting purposes using standardized conversion factors developed by *Marine Fisheries*. Values represent the combined price paid to growers by dealers.

Table 8. 2014 Aquaculture Landings.

2014 American Oyster		
Town or Region	Pieces	Landed Value
Marion	59,375	\$32,852
Nantucket	112,785	\$78,080
Brewster	240,150	\$145,367
Kingston	246,435	\$134,853
Yarmouth	309,689	\$176,512
Plymouth	339,052	\$190,195
Eastham	460,103	\$251,722
Falmouth	657,816	\$387,355
Outer and South Cape Cod*	665,581	\$394,264
Orleans	695,244	\$399,645
Buzzards Bay and Elizabeth Island*	695,340	\$394,014
Dennis	1,510,381	\$874,726
Wareham	1,669,800	\$943,608
Martha's Vineyard	2,348,874	\$1,410,243
Wellfleet	6,208,883	\$3,413,351
Barnstable	7,343,692	\$4,155,226
Duxbury	8,543,154	\$4,882,239
Total	32,106,354	\$18,264,252
2014 Quahog		
Town	Bushels	Landed Value
South Cape Cod*	18	\$1,266
Cape Cod Bay*	41	\$3,417
Wareham	187	\$8,001
Yarmouth	206	\$13,264
Eastham	517	\$17,504
Orleans	958	\$70,709
Barnstable	3,759	\$339,356
Wellfleet	8,405	\$645,411
Total	14,090	\$1,098,929
2014 All Other Aquaculture Species (Softshell Clam, Blue Mussel, Bay Scallop)		\$244,880
2014 Grand Total Aquaculture Landings		\$19,608,061

* Data combined due to confidentiality constraints

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John T. Hughes Hatchery & Research Station

In 2012, *Marine Fisheries* re-named its Oak Bluffs facility the “John T. Hughes Hatchery and Research Station” in recognition of its longtime supervisor and renowned lobster culturist. The facility was also re-purposed to support municipal shellfish propagation programs. To achieve this goal, *Marine Fisheries* formed a partnership with the Martha’s Vineyard Shellfish Group (MVSG), a consortium of the Shellfish Departments of the six towns of Martha’s Vineyard, to grow shellfish at the facility (Figure 18). Access to the facility greatly expanded the MVSG’s capacity to enhance the public shellfish stocks. This activity supports several of the Division’s strategic goals, including improving fisheries sustainability, supporting the Commonwealth’s commercial and recreational fisheries, and providing technical support.

In order to support MVSG’s operations, *Marine Fisheries* completed overdue maintenance and made additional improvements to the building’s structure and equipment, including renovation of the existing green house, upgrades to the seawater and aeration systems, and installation of a new state of the art greenhouse for algal culture. Once completed, MVSG began shellfish culture operations at Hughes Hatchery in May 2012, and completed a productive first season. In 2013, MVSG fine-tuned their operations and increased production. At the end of the year, *Marine Fisheries* renewed its initial two-year agreement with MVSG for an additional three years, through 2016.

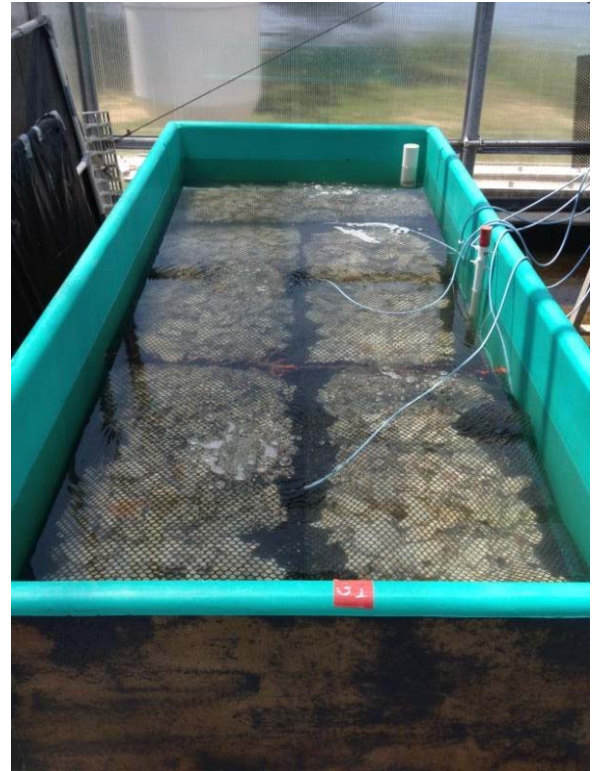


Figure 18. Shellbags in remote set tanks in the new greenhouse at Hughes Hatchery.

The MVSG continued to expand shellfish production at Hughes Hatchery in 2014, as well as develop larval rearing capabilities. Many promising results were achieved for the first time at the hatchery: oyster and scallop larvae were produced; phytoplankton tanks provided additional food for setting quahogs, scallops, and spat-on-shell oysters; quahog and scallop larvae were set in re-circulated and flow-through systems; and blue mussel seed was cultured. Shellfish production at Hughes Hatchery during 2014 included 6.5 million quahogs, 5.5 million eyed oyster larvae (which should yield approximately ½ million spat on shell in the field), 23,000 single oysters and 50,000 blue mussels.

The reopening and re-tasking of the Hughes Hatchery, and resulting increased shellfish production, provides additional educational and economic opportunities for the residents and visitors of Martha’s Vineyard. There is an increased understanding of the role that shellfish play in maintaining and improving water quality and marine habitats. Shellfish production will likely have increasing application in bioremediation projects to restore and protect the water quality and marine ecology of the island’s water bodies.

Vibrio Management

An increasing component of the *Marine Fisheries* Shellfish Program's public health protection responsibilities is the implementation of control measures intended to limit the human health risks associated with the exposure of *Vibrio parahaemolyticus* bacteria (*Vibrio*) from the consumption of raw oysters. Exposure to *Vibrio* can cause gastrointestinal illness and in some cases can be lethal; as a result, the USFDA requires NSSP member states with a history of *Vibrio* illness to monitor conditions in oyster harvest areas, implement *Vibrio* control measures, and respond in the event of a *Vibrio* illness outbreak associated with shellfish consumption. *Marine Fisheries*' staff annually maintains air and water temperature monitoring equipment in 16 Massachusetts shellfish growing areas and collects and analyzes samples to determine the level of *Vibrio* present in oyster tissue in major oyster production areas in the state. *Marine Fisheries* staff also conducts checks of harvester compliance with *Marine Fisheries* *Vibrio* harvest and handling regulations and are responsible for the closure of harvest areas following the notification of a *Vibrio* outbreak from *MassDPH*.

Since 2011, Massachusetts has seen an increase in the number of *Vibrio* cases reported to the state (Table 9). As a result of two cases of *Vibrio* traced back to oysters harvested in Eastern Cape Cod Bay (ECCB) in 2011, USFDA directed *MassDPH* and *Marine Fisheries* to implement control measures intended to limit the post-harvest growth of *Vibrio* in oysters during warm weather months. In 2012, *MassDPH* and *Marine Fisheries* jointly developed and issued the first Massachusetts *Vibrio* Control Plan for Oysters, which covered all harvest areas in ECCB. Commercial harvester permits were conditioned accordingly and *Marine Fisheries* Shellfish Program staff conducted routine checks at oyster landings sites to document compliance.

In 2012, additional cases of *Vibrio* illness were reported that traced back to oysters harvested from Massachusetts growing areas, including areas outside of the ECCB control zone. In response, the USFDA mandated that *Vibrio* controls be extended to the entire Massachusetts coastline and more stringent time to temperature restrictions be put in place at the harvester level.

During the summer of 2013, two outbreaks of *Vibrio* were traced back to oysters harvested in Western Cape Cod Bay (CCB45, CCB43) and Katama Bay on Martha's Vineyard (V20) triggering costly growing area closures and product recalls. As a result of the apparent growing public health risk associated with *Vibrio* and raw oyster consumption and the economic impact associated with the 2013 outbreak, *Marine Fisheries* and *MassDPH* implemented stricter controls on oyster harvest and handling practices in the 2014 *Vibrio* Control Plan. To increase the enforcement capacity of these enhanced *Vibrio* control measures, *Marine Fisheries* established regulations pertaining to the harvest and handling of oysters during the *Vibrio* control season (322 CMR 16).

During the 2014 *Vibrio* season, harvesters were required to tag all bags or containers of oysters with the time of harvest and time of icing; maintain a harvest logbook; shade their oysters during harvest and transportation; and adequately ice oysters within two hours of harvest. Additionally, certain aquaculture activities related to the culling and processing of oysters were subject to *Vibrio* related restrictions. Wholesale dealers purchasing oysters from harvesters were required to implement a Hazard Analysis and Critical Control Points Plan that identifies *Vibrio* as a significant hazard; ensure that oysters were chilled to an internal temperature of $\leq 50^{\circ}\text{F}$ within 10 hours of time of harvest;

Table 9. *Vibrio* Cases Related to Consumption of Massachusetts Harvested Shellfish.

Year	# of cases
2011	2
2012	9
2013	33
2014	11

maintain an ambient air temperature of 45°F; and keep receiving records of pertinent harvester information. Beyond the increased controls in 2014, *Marine Fisheries* dedicated fulltime staff to *Vibrio* management and made significant investments in laboratory equipment and staff training to increase *Marine Fisheries*' environmental monitoring and *Vibrio* research capacity. *Marine Fisheries*, in cooperation with local shellfish constables and the Massachusetts Office of Law Enforcement, also increased compliance monitoring efforts from 115 monitoring events in 2013 to over 300 in 2014.

Marine Fisheries and *MassDPH* evaluate the effectiveness of *Vibrio* controls annually and work with industry and other stakeholders to make improvements and incorporate state specific data where possible. A number of proposed changes to the *Vibrio* Control Plan and its implementing regulations for the 2015 season were under development at year's end. These changes primarily focus on improving and clarifying adequate icing and shading controls, oyster tagging and logbook reporting requirements and re-submergence protocols related to oysters that have been processed or culled by shellfish growers.

Other Activities

Professional Organizations: Program staff participated in many professional organizations such as the Northeast Shellfish Sanitation Association, the Massachusetts Shellfish Officers Association, Northeast Laboratory Evaluation Officers and Managers, the New England Estuarine Research Society, and the Interstate Shellfish Sanitation Conference.

Mount Hope Bay Hydrographic Study: From September 8–11, *Marine Fisheries* Shellfish Program staff assisted the Rhode Island Department of Environmental Management, USFDA, and USEPA conduct a hydrographic study of effluent dispersion from the Somerset Waste Water Treatment Plant throughout Mount Hope Bay. Program staff supported the multi-agency team by deploying and retrieving shellfish and containment cages and hydrographic monitoring equipment; providing vessel support within the Taunton River, Mount Hope Bay and tributaries, and the Sakonnet River; and lending lab space and assistance for bacterial analysis of water and shellfish and testing of shellfish for Male-specific Coliphage (MSC), an indicator of viruses from the monitoring sites where shellfish had been deployed. USFDA staff at the Center for Food Safety and Applied Nutrition are processing the collected data, and will provide a report including recommendations regarding classification of the studied water bodies, level of MSC in shellfish, and possible follow-up work to *Marine Fisheries* in 2015.

NBMCT Quahog Mitigation Program: In February, *Marine Fisheries* executed an agreement with the Massachusetts Clean Energy Technology Center (MassCEC) to fulfill certain requirements of the Final Mitigation Plan for the New Bedford Marine Commerce Terminal (NBMCT) as prepared by the Massachusetts Department of Environmental Protection and dated November 14, 2012. The objective of this Mitigation Plan is to compensate for the impacts associated with the NBMCT project. Shellfish are impacted in association with the filling and dredging involved in the project – approximately 9.8 million shellfish assuming that the full project is completed – and will be mitigated for with the seeding of approximately 24.5 million shellfish seed (a 40% survival rate due to predation is assumed).

During Year I of this long term mitigation project, Shellfish Program staff, working in conjunction with the New Bedford Shellfish Constable, conducted initial diver surveys to select the first 10-acre quahog seeding site in New Bedford's Outer Harbor. Equipment for permanently marking the site

was purchased and assembled, and authorization for placing the markers obtained from the US Coast Guard and New Bedford Harbor Commission. Specialized equipment for transporting and distributing the quahog seed at the planting site and scientific survey equipment for post planting surveys was also purchased. However, the team ran into difficulties procuring the 2 million seed quahogs in 2014 from the two MA shellfish hatcheries with which arrangements had been made; consequently, seeding activity was postponed until 2015. Following a review of the quahog planting strategy, the team planned to diversify its sources for quahog seed moving forward and expected to have the mitigation plan back on track in 2015 towards the long-term goal of planting 24.5 million quahogs within New Bedford coastal waters.

GOMC GulfWatch: Shellfish staff also collected mussel samples for the Gulf of Maine Council (GOMC) GulfWatch Mussel Sampling Program at three sites: Merrimack River in Newburyport, Deer Island in Boston and Buckley's Bar in Quincy. Samples were analyzed for metals and PCB contamination.

MSC UNH Seagrass Collaborative Research: *Marine Fisheries* continued its partnership with New Hampshire Sea Grant/University of New Hampshire, Spinney Creek Shellfish Inc. of Eliot Maine, USFDA's Gulf Coast Seafood Laboratory, and the Maine Department of Marine Resources, in a collaborative study of Male-specific coliphage (MSC). Male-specific coliphage (MSC), a bacteriophage of *E. coli* bacteria, has been validated for use as a viral indicator of enteric viral contamination within the NSSP. MSC is not a replacement for fecal coliform within the NSSP, but rather a specialty indicator reflecting the persistence of viruses in molluscan shellfish. The study was funded by the NOAA Sea Grant Aquaculture Research Program in 2012.

Neoplasia Monitoring: Incidence of Hemic Neoplasia in softshell clams throughout the Commonwealth remains high. *Marine Fisheries* continues collection of clams for a long term study with a researcher at West Chester University in Pennsylvania, in an effort to track the prevalence and extent of the soft clam disease throughout Massachusetts coastal waters. Neoplasia has historically been implicated in clam die-offs on Cape Cod, in Boston Harbor, and the North Shore of Massachusetts, as well as other regions of the east coast.

Habitat Program

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Overview

The goal of the Habitat Program is to protect and enhance marine fisheries resources. Strategies include: 1) reviewing coastal alteration projects and providing science-based guidance that addresses their potential impacts on fisheries resources and habitats of the Commonwealth; 2) initiating and performing fisheries habitat research and applied studies; 3) developing and overseeing *Marine Fisheries'* climate change program; 4) supporting ocean planning in the Northeast; and 5) coordinating technical responses to emerging issues.

In 2014, Habitat Program staff reviewed 556 projects, representing 104 municipalities. Reviews included beach nourishment projects, repair of failing sewer pipes, tide gate designs, waterfront developments, and significant dredging projects in Boston and New Bedford. The In-lieu Fee (ILF) mitigation project oversaw four restoration projects and continued to assist in expanding ILF to a Department-wide program. Monitoring of the state's four artificial reefs was conducted and the impact of dock shading on salt marsh health was assessed. One acre of eelgrass was planted in Boston and Salem Harbors. Losses of eelgrass in Nahant and Duxbury Bays were quantified using new hydroacoustic technology. Panoramic mapping methods were developed for future flying camera work. The Habitat Program supported the Massachusetts Ocean Plan revision, and continued to foster new partnerships with MIT, MassBays, and SMAST. Program staff also represented *Marine Fisheries* on a variety of committees and supported other Division programs.

Technical Review Project

The Technical Review Project provides input to the Massachusetts environmental permitting process through review and comment to permitting agencies on a project's potential impact to marine fisheries resources and habitats. This project is also responsible for recommending mitigation and tracking mitigation projects and reviewing state and federal policy documents. To meet these goals, the Technical Review team tracks coastal and marine construction projects, solicits specific resource

information from *Marine Fisheries* biologists, conducts literature reviews, attends site visits, writes project comment letters, reviews options for compensatory mitigation, and participates in interagency meetings. The Technical Review team also creates programmatic approaches to resource recommendations, improves access to coastal resource information, and conducts research specific to review needs.

Technical Review

In 2014, 556 specific projects in 104 municipalities were reviewed. Of these projects, 352 were new projects. Four full-time staff members dedicated up to 75% of their time to technical review, while one part-time contractor continued to play a vital role in maintaining records and assisting with the preparation of our comment letters in New Bedford.

Major review projects included: Salem Lateral LNG pipeline; Long Island Bridge demolition; Sandwich Town Neck erosion project; Logan Runway Mitigation; ComCast/NSTAR fiber optic cable in Martha's Vineyard; Wynn Casino in Everett; and Boston Harbor Deep Draft Navigation Improvements.

Several other major activities follow. Staff participated in sea level rise meetings and engineering workshops to better understand the practical issues associated with sea level rise and the various shoreline protection efforts underway. The Project received a \$240,000 grant from Sandy Relief Funds to develop a biologically friendly shoreline protection structure and determine beneficial reuse options for the Boston Harbor Deep Draft Navigation Improvements. Staff edited EOEEA's nutrient removal guidance document, focusing on sections characterizing the effectiveness of using shellfish and algae for nutrient remediation. Staff reviewed the Army Corps of Engineers' revision of the Massachusetts General Permit which underwent extensive and complicated changes including significant changes in the protections of submerged aquatic vegetation. Staff also reviewed the Monomoy National Wildlife Refuge's Draft Comprehensive Conservation and Management Plan, which included complex boundary and jurisdictional issues. We participated in scoping of restoration projects with the Natural Resource Damages Trustee Council for the Bouchard Barge-120 oil spill. Lastly, staff participated on several technical advisory panels, pre-application discussions, and on related committees including the Massachusetts Bays Management Committee.

Data Management

Data management and archiving are important parts of the Technical Review project. Our archiving standard was developed in 2012 and our Access database was developed in 2013. During 2014, we continued to implement and improve these systems.

In Lieu Fee Program

This was the sixth year of the *Marine Fisheries* and Army Corps of Engineers (Army Corps) In Lieu Fee (ILF) Program. This program addresses authorized impacts of less than one acre in extent to coastal aquatic resources, in particular Essential Fish Habitat (EFH) and aquatic habitats of managed diadromous fish and marine finfish and shellfish species in Massachusetts' waters, resulting from projects permitted under the Massachusetts General Permit (GP). Twenty-seven projects impacting 18,980 square feet of aquatic habitats have contributed nearly \$230,000 to the program between 2009 and 2013. All obligations under the program, including project tracking, fund disbursement, and annual reporting, were accomplished.

In 2014, three restoration projects selected through a Request for Proposals process in 2013 and funded by ILF funds were completed; a fourth was still awaiting matching funds at year's end. Project staff will continue to track the monitoring component of funded projects for a period of at least five years (Figure 19).

Throughout 2014, program staff continued to work with the Commissioner of *MassDFG*, *MassDFG* staff, and the Army Corps in developing a statewide ILF Program that will address unavoidable impacts under the GP as well as unavoidable impacts associated with Individual Permit projects. On May 23, 2014, *MassDFG* and the Army Corps New England District Engineer signed the Commonwealth of Massachusetts Final In-Lieu Fee Program Instrument, officially designating *MassDFG* as the program sponsor for a new, comprehensive, statewide ILF program for Massachusetts. Project staff participation with Department staff in the development and administration of *MassDFG's* ILF Program was ongoing.



Figure 19. The Off-Billington Street Dam Removal Project: on the left is the impoundment prior to dam removal in April 2013; in the center is the drained impoundment and engineered stream bed in April 2014; and on the right is the stream in September 2014 after one full growing season. Over \$122,000 in ILF funds were used for vegetating the embankment created when impoundment upstream of dam was removed.

Fisheries Habitat Research Project

The Fisheries Habitat Research Project conducts research, monitoring, and restoration relevant to the mapping, identification, and quality of marine fisheries habitats. Research projects in 2014 included eelgrass monitoring, restoration, conservation, and mapping; artificial reef siting, construction, and monitoring; dock impacts on salt marsh; and bottom temperature continuous monitoring. Project staff serve on a variety of habitat-related committees, including the ASMFC Habitat and Reef Committees, the Atlantic Coastal Fish Habitat Partnership, the NEFMC Habitat Plan Development Team, the NROC Habitat Classification Working Group, and the NERACOOS Benthic Working Group. We also participate in working groups for the Boston Harbor Habitat Coalition. Some of the highlights from committee work in 2014 include editing the ASMFC Habitat Hotline and describing potential closed areas for the Omnibus Habitat Amendment for NEFMC.

Habitat Characterization

The Habitat Research team conducts research focused on seafloor mapping. Using single-beam sonar, sidescan sonar, and video equipment, the team maps eelgrass beds and shallow coastal areas not covered by other seafloor mapping studies in each year (Figure 20). In 2014, we optimized two hydroacoustic methods for mapping eelgrass which we used to document eelgrass losses in Nahant and Duxbury Harbors, where we estimated a loss of 700 acres of eelgrass since 2012. Part of this

work included the novel use of a jetski to map habitat in very shallow water (Figure 21). We also developed a workflow for using flying remote controlled cameras to map eelgrass and coastal habitats; due to licensing restrictions, we were unable to deploy this instrumentation in 2014.

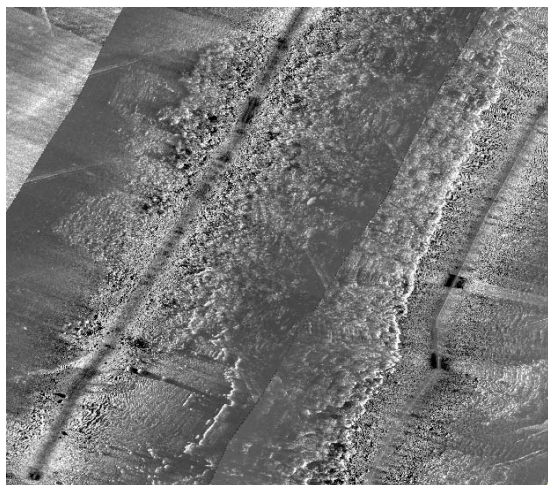


Figure 20. A hydroacoustic image of eelgrass in Plymouth Harbor.



Figure 21. Equipment is pulled behind a jetski to map eelgrass in very shallow water.

The Project undertook a mapping project in 2013 that used the Coastal and Marine Ecological Classification System (CMECS), a national standard for the classification of marine habitats, to map Boston Harbor. This work was finalized and released publicly in early 2014.

Due to the update of the Massachusetts Ocean Plan, the habitat team updated assessments done for the 2009 ocean plan and created new data products to further explore spatial distribution of fish. As part of this work, we scoped out a direction for making that data more available to the environmental review community.

Eelgrass

Due to its value in supporting commercial and recreational fisheries and its vulnerability to impact, eelgrass has been a habitat of primary importance to the Division for over a decade. The eelgrass team focuses on research, monitoring, and restoration of eelgrass in Massachusetts. The team is in its eighth year of monitoring a long-term transect in an eelgrass bed in Salem Sound, as part of the international SeagrassNet monitoring program which tracks short- and long-term trends in eelgrass distribution and health. This program is an important “canary in the coal mine” with respect to assessing threats to eelgrass, including wasting disease and invasive species. To better integrate with invasive species monitoring efforts, the Marine Invader Monitoring and Information Collaborative sampling and reporting protocol was implemented in 2014.

For restoration, the eelgrass team continued test planting, full-scale planting, and monitoring at multiple sites in Boston Harbor and Salem Sound as part of the second Hubline mitigation-funded eelgrass restoration. This program is the largest and most successful eelgrass restoration activity in Massachusetts.

Because restoration remains a difficult and expensive process, the eelgrass team continued to focus on establishing effective conservation methods for eelgrass. Many mooring fields occur in eelgrass

meadows and traditional chain moorings create scars in the meadows. In order to minimize this type of damage to existing beds, moorings with flexible rubber rods which don't drag on the seafloor were developed. We have been studying these "conservation moorings" to determine if they prevent eelgrass damage and enable re-growth of eelgrass into the scars. We found mixed results because proper installation and maintenance of these moorings is more difficult than with traditional mooring systems. Also, in some cases it appears that the scars are inhospitable to eelgrass due to a change in depth and sediment type. Full eelgrass recovery may not be possible in some cases, and will take several years in other cases. Also, fouled conservation moorings caused additional damage to eelgrass. These mixed results make us cautious in recommending conservation moorings as an option to reduce impacts to eelgrass. Additional monitoring will be conducted in 2015 to assess the efficacy of this approach to protect eelgrass.

The eelgrass team also contributed to a *Marine Fisheries* video that, in part, teaches about the importance of eelgrass.

Artificial Reefs

Properly sited and constructed artificial reefs serve as hard bottom structured habitat for marine fish and invertebrate species and provide near-shore fishing opportunities for anglers. The Fisheries Habitat team has been collaborating with the towns of Harwich and Yarmouth since 2009 to acquire permits for creating a new artificial reef off the coast of Harwich and to reopen a previously permitted reef site off the coast of Yarmouth. All permits were received in 2014, shifting focus to procuring material and funding to get the material on-sight. Program staff also revisited permanent monitoring stations at all four state-permitted artificial reef locations and installed bottom temperature monitoring stations at the sites. Monitoring sites are visited annually to document the presence of finfish, invertebrates, and invasive species (Figure 22).



Figure 22. Left: a temperature monitor installed at the Dartmouth reef site. Right: a Division diver uses a head-mounted camera to collect image data from an artificial reef site.

Salt Marsh

Many docks and piers are constructed over salt marsh in order to access bordering estuaries. The proliferation of small docks and piers in coastal states has led to concerns about cumulative environmental impacts. Previous studies comparing marsh vegetation under existing docks to unshaded areas have shown reductions in marsh density under docks, presumably due to light

limitation. Salt marsh provides a variety of ecosystem services, including habitat and energy sources for many fish and invertebrate species. Dock shading could reduce these ecological functions, particularly when considered in terms of the cumulative impacts of dock proliferation across an ecosystem or interactions with other stressors.

In 2013 and 2014, the Massachusetts Division of Marine Fisheries (*MarineFisheries*) conducted controlled studies to evaluate the impact of docks on marsh vegetation and abiotic conditions (Figure 23). We found a significant influence of dock height on relative shading impacts, providing experimental evidence that supports maintaining at least a 1:1 height to width ratio, as recommended by state permitting guidelines.



Figure 23. Staff samples vegetation at study docks.

Anadromous Mapping

The Habitat Program facilitated a project with *MarineFisheries* and *MassDOT* to develop a statewide map of spawning runs with site specific time-of-year restriction windows. This three-year *MassDOT*-funded project utilized the data and expertise of several *MarineFisheries* biologists to create an interactive map of the entire coastal zone. The first draft was completed in 2013 and finalized in 2014.

Climate Change

The Climate Change Project was created in 2010 with the goal of providing data and analysis regarding the effect climate change is having on fisheries and marine habitats in Massachusetts. *MarineFisheries* Project Leaders identified three priority action items: 1) create an inventory of existing *MarineFisheries* data sets relevant to climate change research; 2) identify, develop, and publish data collection and storage standards for *MarineFisheries* climate-related data and; 3) begin to examine how to forecast fisheries shifts resulting from climate change. In 2014, 7.2 million temperature records from 26 coastal stations across agency programs were assembled into an Access database (Figure 24). All temperature monitors were inventoried and opportunities for expanding the network at low to no cost were implemented. Monitoring stations needing update and/or redundant temperature monitors were identified and replacement was started. We continued participation on several climate change-related committees, including the Gulf of Maine Climate Network's Sentinel Monitoring Project and EOEEA's Climate Change Adaptation subcommittee. A workshop on ocean acidification, organized by the think-tank Woods Hole Research Center, prominently featured *MarineFisheries* expertise. Many other Division staff continued their involvement with climate change related activities as well, primarily focusing on changes associated with sea level rise and acidification.

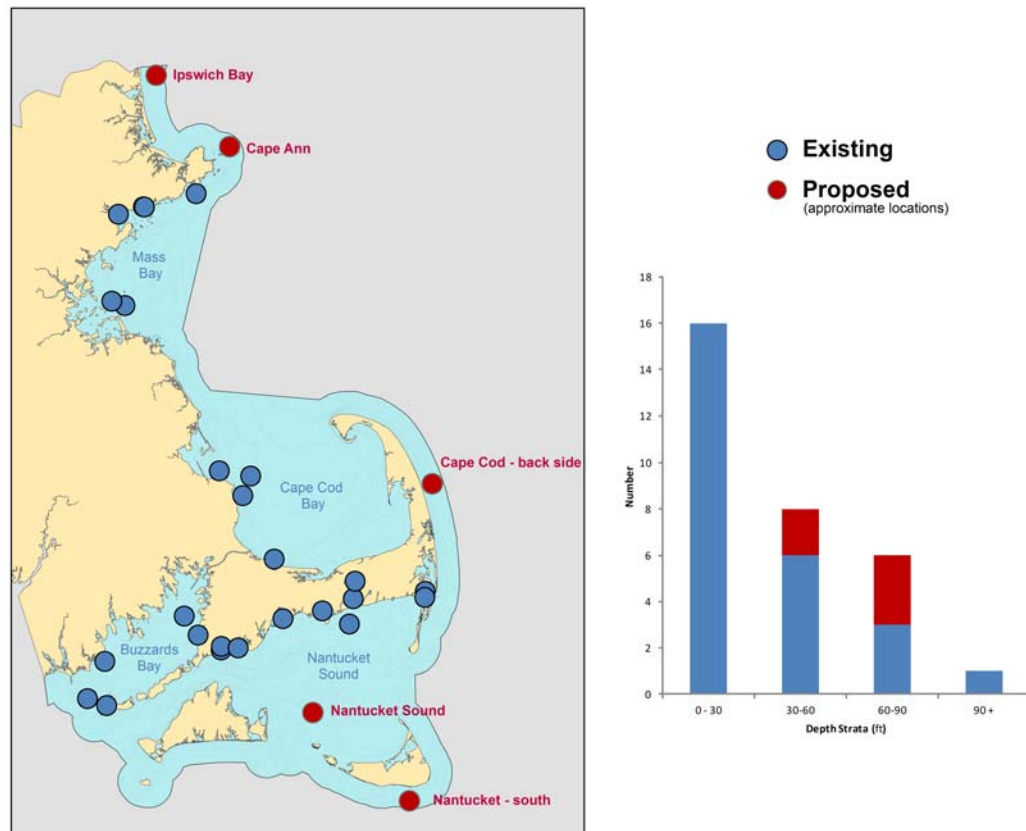


Figure 24. DMF year-round bottom temperature monitor locations.

Offshore Wind & Ocean Planning

The Massachusetts Wind Energy Area was designated in an area south of Martha's Vineyard in 2014 (Figure 25). *Marine Fisheries* participates on the Massachusetts Renewable Energy Task Force and the Joint RI-MA Renewable Energy Task Force, as well as the Habitat and Fisheries Workgroups for the Mass Wind Energy Area. Discussions in 2014 focused on the sale of leases in the area which would be done by auction in January 2015. Offshore wind activities also included reviewing status reports from marine mammal, turtle, bird, and seafloor research in the area.

Driven by the emergence of offshore energy projects, including wind and LNG, ocean planning has been a focus in the state for the past decade and regionally for the past five years. The Massachusetts Ocean Plan was promulgated in 2009 with a required update cycle of five years. Therefore, extensive participation with ocean planning was a large focus of 2014 via participation on the Science Advisory Council and the Ocean Advisory Commission. Activities included writing the Fisheries Workgroup report and reviewing and editing drafts of the Baseline Assessment, the Ocean Plan, and the Science Framework. In-depth discussions of offshore sand mining and aquaculture were focal points of *Marine Fisheries* involvement. Additionally, several maps referenced by the Plan's siting and performance standards for construction projects were developed by the Fisheries Workgroup, which was chaired and staffed by the Habitat Program.

Regional ocean planning activities are centered around the Northeast Regional Planning Body (NERPB) which is supported by the Northeast Regional Ocean Council. The Habitat Program has participated as a designee of the Director on the NERPB and plays an active role in various

committees and subcommittees. Many other Division staff have reviewed documents, research activities, and participated on subcommittees related to ocean planning.

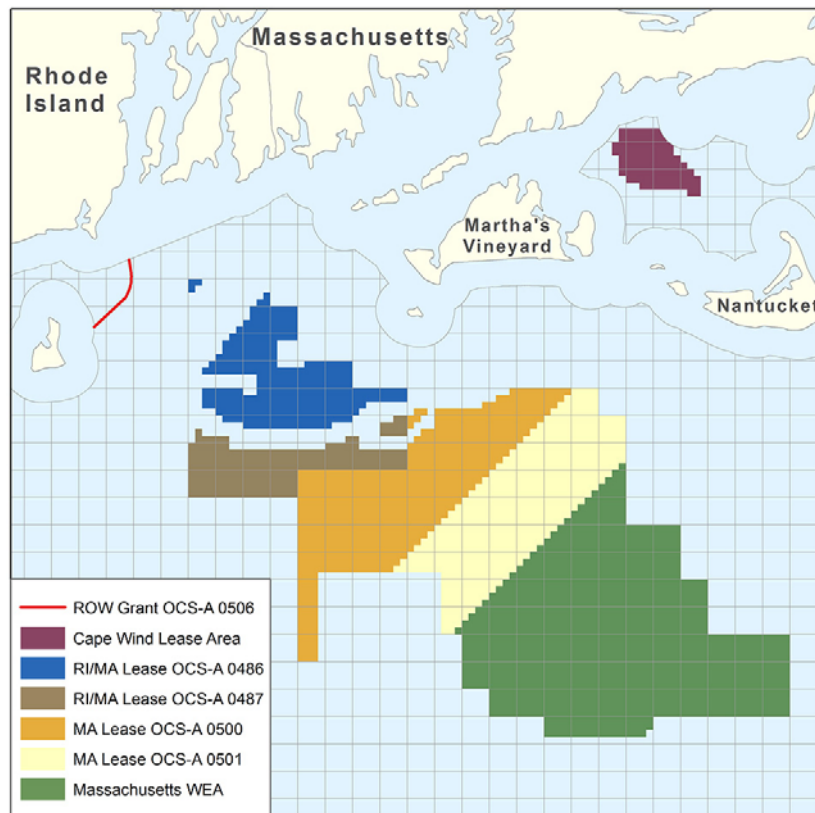


Figure 25. Wind Energy Areas (WEAs) adjacent to Massachusetts.

FISHERIES BIOLOGY SECTION

Dr. Michael Armstrong, Section Leader

Fish Biology Program

Personnel

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Elise Koob, Ageing Technician

Overview

The objectives of the Fish Biology Program are to collect, process, and analyze biological data on recreationally- and commercially-important fishes needed for effective, science-based management of Massachusetts' fisheries resources. Biological data collected from harvested and released fishes include age structures (i.e., scales, otoliths, and vertebrae), length frequencies, maturity stages, and bycatch levels. All data are used in stock assessments to determine the status of those resources. In addition, information on catch and effort of recreational anglers are collected via volunteer surveys. Special research projects are also conducted to address specific management actions.

Age and Growth Project

In 2014, staff aged hard-part structures from American shad (*Alosa sapidissima*), bluefish (*Pomatomus saltatrix*), black sea bass (*Centropristis striata*), river herring (alewife, *Alosa pseudoharengus*, and blueback herring, *Alosa aestivalis*), fluke (*Paralichthys dentatus*), striped bass (*Morone saxatilis*), scup (*Stenotomus chrysops*), tautog (*Tautoga onitis*), and winter flounder (*Pseudopleuronectes americanus*). [Table 10](#) shows the number of samples processed.

Table 10. Samples processed for age in 2014; all samples were collected in 2014.

Species	Structure	Process	Quantity (Fish)
American Shad	Otoliths and Scales	Otoliths aged, scales checked for repeat spawning	304
Bluefish	Otoliths	Baked, Sectioned, Aged	114
Black Sea Bass	Otoliths and Scales	Cleaned, Mounted, Aged	521
River Herring	Otoliths and Scales	Cleaned, Mounted, Aged	6,384
Fluke	Scales	Cleaned, Pressed	20
Striped Bass	Otoliths	Extracted, Sectioned, Aged	54
Striped Bass	Scales	Cleaned, Pressed	1,740
Scup	Scales	Cleaned, Pressed	102
Tautog	Otoliths and Opercula	Cleaned, Sectioned, Aged	700
Winter Flounder	Otolith	Sectioned and Aged	1,105

Several species projects in which the Age and Growth Project was involved in 2014 are highlighted below.

River herring: Sampling of river herring bycatch from the Atlantic herring fishery continued in 2014 (n=2,400). Otoliths and genetic samples were collected to aid in a project to better understand the composition of the bycatch. Age and genetic sampling will continue in 2015.

Alewife were collected from the Division's resource assessment trawl survey in the spring of 2014 to better understand size distributions of age 1 and 2 fish (Figure 26). Samples will need to be collected annually to define the size distributions of these cohorts as length distributions are expected to change slightly each year.

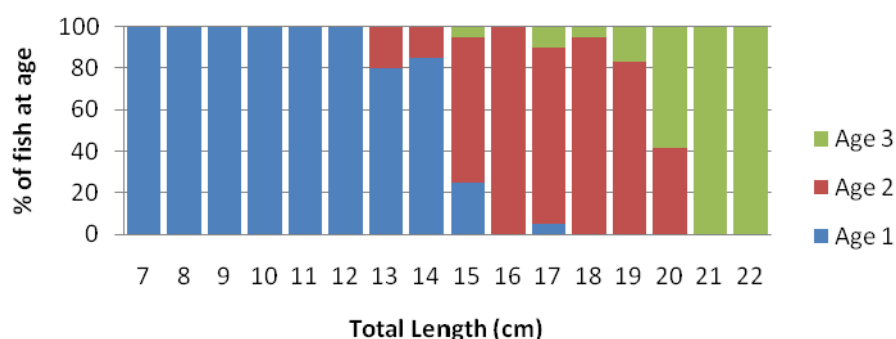


Figure 26. Alewife age-length key for fish captured by the resource assessment trawl survey.

Tautog: The study of the age and growth of tautog continued in 2014. Staff found great disparities in the size-at-age for tautog in Buzzards Bay (Figure 27). To gain understanding of the potential causes of the different growth patterns, fish were collected from several locations within Buzzards Bay for genetic analysis. Preliminary results indicated no genetic differences among these growth morphs. An acoustic tagging pilot study was also initiated in 2014 to investigate potential behavioral differences that may explain the observed disparity in growth.

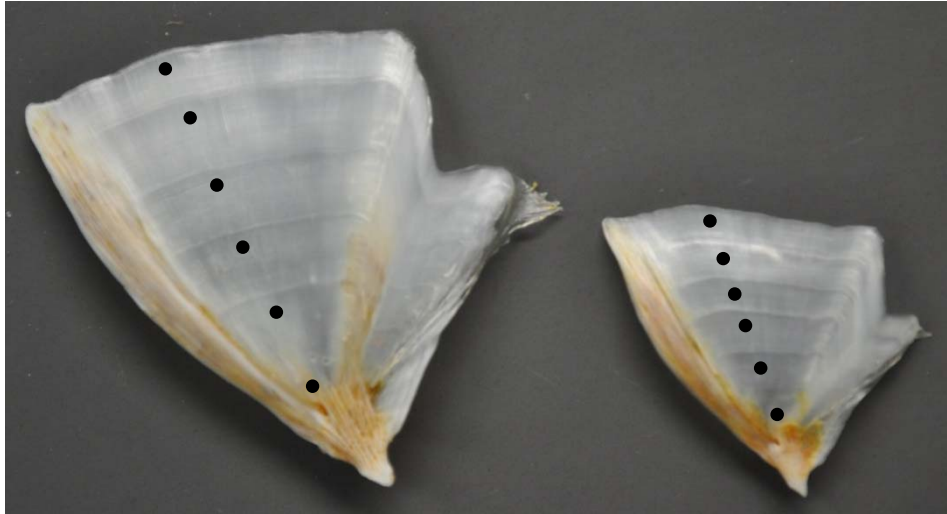


Figure 27. Opercula from two age-6 tautog. Black dots mark the annuli. The one on the left came from a 407mm fish while the one on the right came from a 261mm fish.

In addition, the Age and Growth lab initiated a comparison study to identify other hard-part structures that could be used to reliably age tautog and the removal of which would not affect the market condition of commercially-caught fish. Scales, spines, opercula and otoliths were compared; the results of that study were under preparation in manuscript form at year's end.

Other activities: In 2014, Age and Growth staff met and consulted with researchers from several organizations including the University of New Hampshire, Northeastern University and the Connecticut Department of Energy and Environmental Protection. Staff also participated in the Marine Science Symposium for high school students at Endicott College.

Laboratory staff participated in an ASMFC-sponsored ageing workshop for scup and fluke. A collection of scales and otoliths was exchanged among states prior to the workshop to assess ageing precision coastwide. Staff then met in Virginia in December to review data and standardize ageing methods. Further ASMFC related activities included writing a scale background section and a river herring ageing protocol for inclusion in the upcoming version of the age determination manual being produced by the ASMFC and Gulf States Marine Fisheries Commission.

In 2014, staff created an Access database to efficiently store ages and associated biological data collected and aged by the Age and Growth Lab.

In 2014, a paper comparing ageing precision between scales, otoliths, opercula and vertebrae from American shad was accepted for publication:

Elzey, S. P., K. A. Rogers, and K. J. Trull. 2015. Comparison of 4 aging structures in the American shad (Alosa sapidissima). Fish. Bull. 113: 47-54.

Fisheries Dependent Sampling Project

The Fisheries Dependent Sampling Project is responsible for the at-sea and shore-side sampling of catch, and assessment of fishery performance from the commercial fisheries that occur in and adjacent to Massachusetts territorial waters. The Project also conducts other fish biology research studies and provides support to other projects and senior staff.

Commercial Fisheries Sampling

Project staff collects data and biological samples from commercial fisheries to document fishery performance, characterize the fishery for stock assessment research, and answer specific management questions. Data collected strengthens *Marine Fisheries'* participation on—and contributions to—the regional fishery management councils and ASMFC.

Port sampling of commercial catch was performed in collaboration with fisheries-dependent studies. Project staff updated their sampling matrix, through which they establish sampling priorities based on data needs for species caught by the Massachusetts commercial fishing fleet. Port landed, gear type, dealer, and time of year are examined for each species to determine the best time and location to representatively sample catch. Revisions to the matrix in 2014 included refining scup sampling to occur only during the winter trawl fishery, and removing northern shrimp sampling due to a moratorium on the fishery. Species sampled in 2014 include: black sea bass, tautog, bluefish, longfin squid, striped bass, horseshoe crabs, whelk, and spiny dogfish (Table 11).

In 2014, regulatory revisions to the commercial striped bass fishery (including fewer open days per week and lower daily limits) led to a prolonged season and enhanced the ability for *Marine Fisheries* staff to collect more samples. Sampling of spiny dogfish also increased due to their market rebounding in 2014; Chatham was the primary port where landings and sampling occurred. Scup sampling did not occur as planned, as the targeted winter trawl fishery had minimal landings in Massachusetts.

Table 11. Number of port sampling events, or trips, made to intercept vessels or dealers where information was collected in 2014.

Species	Trips Intercepted	Number of Individuals	Number of Age Samples
Black sea bass	7	249	79
Bluefish	2	83	0
Horseshoe crab	2	57	0
Longfin squid	6	587	0
Spiny dogfish	59	1,051	0
Striped bass	63	794	794
Tautog	9	200	0
Whelk	2	67	0

Regarding at-sea sampling, the Project's largest undertaking in 2014 was sampling the commercial lobster fishery (Table 12). This was typical, as Project staff have historically supported the Invertebrate Fisheries Project in commercial sea sampling on state lobster boats between May and November. Homeports of vessels sampled include: Rockport, Gloucester, Beverly, Boston, Provincetown, Orleans, and Chatham. Sampling of state waters longfin squid trawl and summer flounder fisheries was reduced in 2014 due to increased coverage by federal fisheries observers. State waters groundfish effort was limited to a few vessels in 2014, the low amount of groundfish effort resulted in just one observation of the fishery.

Project staff also continued sea sampling support on a collaborative study including The Nature Conservancy, the New England groundfish management Sector 10, SMAST, NEFMC, and Stellwagen Bank National Marine Sanctuary that will describe the distribution of spawning cod in Massachusetts

Bay and adjacent waters. FDS's role was to characterize catches on commercial groundfish vessels and collect biological data and samples that will help inform the study. State samplers, as well as contracted personnel, conducted 10 trips on state and federal bottom otter trawl and gillnet vessels that were based out of ports based out of Gloucester and Scituate. Staff also participated in fisheries independent studies including Resource Assessment and Acoustic Telemetry.

Table 12. Summary of at-sea sampling efforts by Project staff in 2014.

Sea Days	Project
65	Lobster fishery (trap)
11	Federal and state waters groundfish
5	Longfin squid (trawl)
2	Summer flounder (trawl)
18	Acoustic telemetry studies
17	Resource assessment

Atlantic Herring Fishery Portside Sampling and River Herring Bycatch Avoidance

Marine Fisheries' Fisheries Dependent Sampling staff continued portside sampling of the Atlantic herring and mackerel midwater trawl (MWT) and bottom trawl fisheries, and administering the River Herring Bycatch Avoidance programs, in collaboration with industry and SMAST. Funding for sampling and bycatch avoidance was provided by The Nature Conservancy and the NOAA-issued Atlantic Herring Research Set-Aside (RSA). The RSA was distributed amongst eight vessels; their harvest of roughly 750mt of RSA herring in November and December 2014 provided over \$50,000 back to the program.

In 2014, with the aid of contracted biologists, *Marine Fisheries* sampled 146 trips portside ([Figure 28](#)), and incorporated data from an additional 134 trips sampled by other programs (most often the Northeast Fisheries Observer Program). From landings in Massachusetts ports, 73 MWT trips totaling 14,967 metric tons of herring or mackerel were sampled. From bottom trawl landings in Rhode Island ports, 73 trips totaling 2,006 metric tons were sampled. From these sampled landings, over 12,000 Atlantic herring and over 2,500 mackerel lengths were collected. Over 2,900 river herring lengths were recorded and over 3,000 individuals were collected and frozen for further analysis.

The goal of the associated bycatch avoidance program is to reduce the incidental catch of river herring (alewife and blueback herring) and American shad in the pelagic MWT fishery and the Rhode Island-based small-mesh bottom trawl (RI SMBT) fishery. Under the bycatch avoidance program, portside sampling data is aggregated and bycatch rates are reported back to the industry, allowing vessels to make more informed decisions about where to fish to avoid river herring and shad bycatch.

Large scale improvements were made to the program over the course of the year. Participating MWT vessels granted *Marine Fisheries* access to a shore-based fleet management tool called BTConnect, allowing further oversight by bycatch avoidance program administrators. Midwater trawl vessels were also outfitted with onboard laptops that run BTVessel, a satellite-based communication software. Captains are now able to complete custom made Tow Reports and Trip Reports, sending real-time data to the program from any location. These data, which includes at-sea Fisheries Observer bycatch data, can be used immediately to notify vessels of bycatch concerns.

BTVessel also allows vessels to communicate trip level data, such as landing port and time, allowing for more efficient deployment of portside samplers.



Figure 28. *MarineFisheries* Assistant Biologist Nick Buchan conducts portside sampling of herring landings.

With the implementation of this electronic reporting, *MarineFisheries* was able to drastically reduce data-lag. When necessary, bycatch advisories were disseminated within minutes of a tow being finalized, as opposed to days later when catch was brought to shore for sampling. Overall, five immediate bycatch alerts and 13 weekly sampling summaries were distributed to the fleets. Preliminary expansions of sampling data show that roughly 97mt of river herring were taken as bycatch in 2014. This is considerably less than 2013 bycatch levels, and less than the previous five year average of 300mt.

Project staff conducted extensive outreach with industry, fisheries managers, and stakeholders during the year. Project staff presented at a

meeting of the Stellwagen Bank Marine Sanctuary and Northeast Fisheries Observer Program High Volume Observer trainings. *MarineFisheries* staff participated in multi-day workshops focusing on fisheries dependent data collection and electronic monitoring. Staff presented their work with the RI SMBT fishery at the annual American Fisheries Society meeting in Quebec in August.

MarineFisheries and SMAST staff published a peer reviewed paper in the July 2014 edition of North American Journal of Fisheries Management titled:

N. David Bethoney, Kevin D. E. Stokesbury, Bradley P. Schondelmeier, William S. Hoffman & Michael P. Armstrong (2014) Characterization of River Herring Bycatch in the Northwest Atlantic Midwater Trawl Fisheries, North American Journal of Fisheries Management, 34:4, 828-838.

While port sampling, Project staff also collected samples and calculated the gonad somatic index (GSI) of Atlantic herring commercial landings from Management Area 1A. This index is used to inform managers about the timing of spawning and is a trigger for the Massachusetts/New Hampshire Spawning Area Closure. In 2014, *MarineFisheries* sampled 6 trips from August 19 to September 16. Based upon these samples, it was determined that the default closure (9/21-10/18) would accurately protect Atlantic herring spawning activities in the area. Further sampling of commercial catches immediately after the area re-opened found that herring were no longer in spawning condition, and a subsequent closure was not necessary. In addition to sampling Area 1A spawning fish, *MarineFisheries* conducted five GSI samples on landings from Georges Bank, starting on August 2. While there are currently no regulations that limit harvest of spawning herring on Georges Bank, collection of spawning data from these offshore areas has been a priority for years.

Most notably in 2014, *Marine Fisheries* worked with NEFMC to conduct an evaluation of the River Herring Bycatch Avoidance program, which had been recommended as part of Amendment 5 to the Atlantic Herring FMP. A comprehensive overview and evaluation of the program was presented to the Herring Plan Development Team, Advisory Panel, and Oversight Committee in October and November. Anticipating future management measures, Project staff has contributed to the development of NEFMC/MAFMC omnibus amendment that will allow the Atlantic herring/mackerel industry to fund increased monitoring. *Marine Fisheries* has shown that portside sampling is a cost-effective, statistically-sound, and industry-supported method of characterizing landings in the Atlantic herring/mackerel midwater trawl fisheries. Project staff met with NOAA and NEFMC staff to assist with future plan development and will play a role in the future.

Special Fisheries Research Projects

Atlantic Cod Spawning Activity

Project biologists continued their investigations into the spawning activity of Gulf of Maine cod in 2014. During the spring spawning season, staff deployed an array of 28 acoustic receivers in the state waters Spring Cod Conservation Zone to monitor the movements of returning spawners tagged in previous seasons. Receiver data from 2014 and prior years will be compared to describe the interannual variability in spawning season and location, information that is critical for the development of conservation measures.

Staff conducted a second year of fieldwork under the project aimed at describing the distribution of winter spawning cod in Massachusetts Bay. Our team of collaborators including the Nature Conservancy, SMAST, NEFSC and the Stellwagen Bank National Marine Sanctuary were awarded a Saltonstall-Kennedy grant from NOAA Fisheries in 2014, allowing us to continue and expand upon the work that began in 2013. A total of 154 fish were tagged with acoustic transmitters, adding to the 150 that were released the previous year. The team maintained an array of 40 acoustic receivers to record the movements of these fish from September through February, used five passive acoustic monitoring devices to record the spawning vocalizations produced by male cod, and deployed two autonomous underwater vehicles for 21 days each which were programmed to continuously survey nearly all of Massachusetts Bay for the acoustically tagged fish and to record cod vocalizations. Relatively little is known about the spawning time and location for this group of fish and our work will be instrumental in providing the necessary information to design appropriate conservation measures.

Several peer-reviewed papers were published from our cod spawning research in 2014:

*Dean, M. J., W. S. Hoffman, D. R. Zemeckis, and M. P. Armstrong. 2014. Fine-scale diel and gender-based patterns in behaviour of Atlantic cod (Gadus morhua) on a spawning ground in the Western Gulf of Maine. ICES Journal of Marine Science. 71:1474-1489. *selected as an Editor's Choice article, for outstanding quality and broad interest*

Zemeckis, D., Dean, M., and Cadrin, S. 2014. Spawning dynamics and associated management implications for Atlantic cod (Gadus morhua). North American Journal of Fisheries Management. 34:424-442

Zemeckis, D., Hoffman, W., Dean, M., Cadrin, S., and Armstrong, M. 2014. Spawning site fidelity by Atlantic cod (Gadus morhua) in the Gulf of Maine: implications for population structure and rebuilding. ICES Journal of Marine Science. 71: 1356-1365

In light of a 2014 stock assessment update that indicated an all-time low biomass for the GOM cod stock, the NEFMC sought input from *Marine Fisheries* scientists for the development and evaluation of management actions designed to protect the few remaining spawning groups. One of the methods used in this process to identify spawning grounds relied upon the sexually dimorphic behavior revealed through our research, and was presented at the annual meeting of the American Fisheries Society in Quebec in August:

Dean, M. J., W. S. Hoffman, D. R. Zemeckis, M. P. Armstrong, and S. X. Cadrin. "Cod Spawning Behavior and Observed Sex Ratios: A Liability and an Asset" 144th Annual Meeting of the American Fisheries Society. August, 2014. Quebec, QC, Canada

Atlantic Cod Post-Release Mortality

Marine Fisheries biologists continued their collaboration with the New England Aquarium, SMAST, and the University of New England to provide a more accurate estimate of the post-release mortality of recreationally-caught cod. This project, funded under a NOAA Fisheries grant, used acoustic telemetry to monitor the long-term survival of discarded cod caught via hook-and-line. A total of 136 fish were affixed with depth-sensing transmitters and released into a dense array of 31 acoustic receivers, allowing for the determination of mortality from their horizontal and vertical movements (Figure 29). Several environmental and fishery variables were collected for each fish (e.g., fight time, handling time, extent of injury, water temperature) that will allow for the determination of which factors influence post-release survival.



Figure 29. A cod is ready of release after tagging

This project moved from the data collection phase to analysis and writing in 2014, and a paper is expected to be published in late 2015 that will provide a robust estimate of recreational discard mortality for stock assessment and management use. Fishery managers have already sought preliminary information from this work to guide the development of conservation measures for the recreational fishery. Furthermore, the analytical methods developed under this project are already novel contributions by themselves and will likely steer the direction of future discard mortality studies. We partnered with a leading scientist from the Department of Fisheries and Oceans in Canada to publish a paper on a generalized modeling approach for longitudinal discard mortality studies:

Benoit, H. P., Capizzano, C. W., Knotek, R. J., Rudders, D. B., Sulikowski, J. A., Dean, M. J., Hoffman, W., Zemeckis, D. R., and Mandelman, J. W. 2015. A generalized model for longitudinal short- and long-term mortality data for commercial fishery discards and recreational fishery catch-and-releases. ICES Journal of Marine Science.

Striped Bass Research Project

Massachusetts is home to the one of the largest striped bass fisheries in the country. High population abundance of striped bass, the diversity of the Commonwealth's near shore habitat, and many sources of food for striped bass are major factors contributing to the success of this fishery. Without a doubt, striped bass are the backbone of the Massachusetts recreational industry and provide enjoyment to hundreds of thousands of recreational anglers each year. Accordingly, this important resource is given a high level of attention by conducting many special investigations and monitoring programs designed to support the regional management process.

Survival Tagging Study

Marine Fisheries joined the Striped Bass Cooperative State-Federal Coast-wide Tagging Study in 1991. The study's primary objective has been to develop an integrated database of tag releases and recoveries that will provide current information related to striped bass mortality and migration rates. During 2014, Striped Bass Research Project staff conducted 15 trips aboard contracted vessels, tagging a total of 455 striped bass. Trip data were entered into appropriate databases. Annual post-release survival of striped bass (28 inches and greater) tagged in Massachusetts waters has been relatively stable over the last decade, averaging 74%.

Acoustic Tagging Study

This study was a multi-year effort to provide fisheries managers with information that can be used to enhance evaluations of striped bass fishing mortality and the impact of the prohibition on striped bass fishing in federal waters (Exclusive Economic Zone - EEZ). The primary objective was to determine if striped bass located in the EEZ, adjacent to Massachusetts, enter Massachusetts territorial waters. The secondary objectives were to identify the spatiotemporal patterns of local striped bass movements, confirm if the Cape Cod Canal is an important passageway for their migration, and further investigate the temperature and depth preferences of migrating fish. While this project came to a close in 2013, two peer-reviewed papers were published in leading scientific journals in 2014:

Kneebone, J., Hoffman, W., Dean, M., Armstrong M. 2014. Movements of striped bass between the exclusive economic zone and Massachusetts state waters. North American Journal of Fisheries Management. 34: 524-534

Kneebone, J., Hoffman, W., Dean, M., Fox, D., Armstrong M. 2014. Movement patterns and stock composition of adult striped bass tagged in Massachusetts coastal waters. Transactions of the American Fisheries Society. 143: 1115-1129.

Building on this body of work, *Marine Fisheries* biologists began planning for a follow-up study to further describe the mixture of stock origins and migratory pathways of striped bass in Massachusetts and beyond. This new initiative will begin in 2015 and will be an ambitious multi-year effort that employs both acoustic telemetry and genetics.

Market Sampling

Continued and improved monitoring of the age, size, and sex composition of the commercial harvest of striped bass is indispensable for identifying effective management and for substantiating estimates of mortality derived from fishery-independent sources. The objective of this project is to generate a time series database of biological characteristics of Massachusetts's commercial striped bass landings. During 2014, Striped Bass Research Project staff conducted 32 market sampling trips, collecting length, weight, and age structures (scales) from 795 commercially-caught fish. The size distribution of striped bass measured at wholesale dealers is shown in Figure 30.

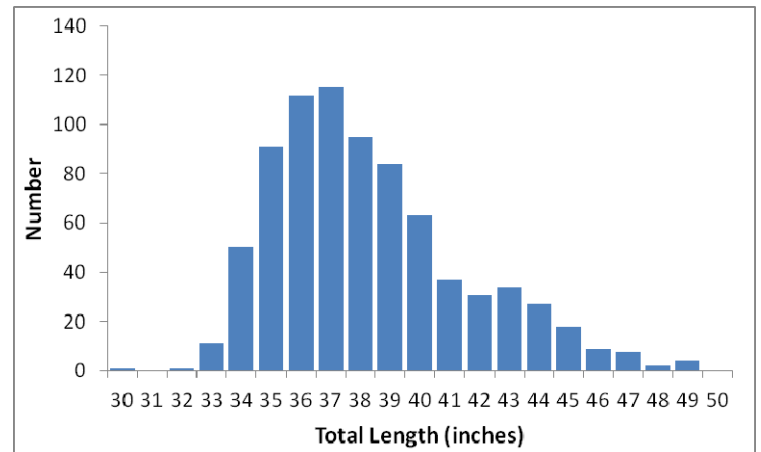


Figure 30. Size distribution of striped bass measured at dealer facilities during market sampling in 2014.

Volunteer Recreational Angler Data Collection Program

Implemented in 2002, the objective of the Sportfish Angler Data Collection Team (SADCT) program is to generate a time series database of biological characteristics of Massachusetts' striped bass recreational catch. During 2014, 41 participating anglers collected over 1,300 paired length/age samples from striped bass. The size composition of striped bass reported by participating anglers and fishing mode (shore versus boat fishing) is shown in Figure 31.

The SADCT program was expanded in 2013 to include black sea bass, scup, and fluke. In 2014, 142 samples from black sea bass, 18 samples from fluke, and 97 samples from scup were collected.

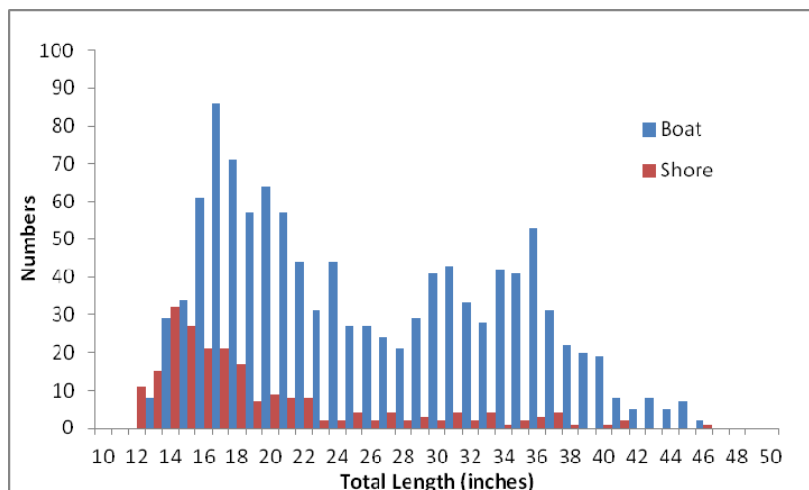


Figure 31. Size composition of striped bass collected by anglers participating in the SADCT program in 2014.

Due to an undetected and unreported error in the website, no anglers registered for the *eLogbook*. Program staff prepared an annual report on the SADCT program for the contributing SADCT anglers and a ten-year retrospective analysis of the SADCT program that was turned into a technical report. The striped bass carcass collection program continued in 2014 and obtained 54 otolith samples from volunteer anglers.

Other Activities

Sportfisheries Technical Assistance

Fish Biology Program staff provide technical expertise to other governmental organizations, private groups, and individuals with concerns about marine fisheries and serve on technical and advisory committees to support management efforts of important marine species. In 2014, Dr. Gary Nelson served as the Massachusetts representative to the ASMFC's Striped Bass Tagging, Technical, and Stock Assessment Committees, and generated the bag and size limit options for Addendum IV to the Interstate Fishery Management Plan for Striped Bass. Micah Dean served on the ASMFC Menhaden Technical Committee and Multispecies Committee. William Hoffman served on the ACCSP Bycatch and Biological Sampling Priorities Committees.

Publications

In addition to the publications previously mentioned, Dr. Gary Nelson published an article on cluster sampling in fisheries research and a book review:

Nelson, G. A. 2014. Cluster sampling: a pervasive, yet little recognized survey design in fisheries research. Transactions of the American Fisheries Society 143: 926-938.

Nelson, G. A. 2014. Book review: Biology and management of inland striped bass and hybrid striped bass. Transactions of the American Fisheries Society 143: 1112-1113.

Assessment and Survey Program

Personnel

Steven J. Correia, Program Manager

Resource Assessment Project

Jeremy King, Senior Biologist

Matthew Camisa, Biologist

Vincent Manfredi, Biologist

Invertebrate Fisheries Project

Robert Glenn, Project Leader

Vin Malkoski, Senior Biologist

Derek Perry, Biologist

Tracy Pugh, Biologist

Kelly Whitmore, Biologist

Steve Wilcox, Assistant Biologist

Mike Trainor, Seasonal Fisheries Technician

Protected Species Project

Erin Burke, Protected Species Specialist

Scientific Diving Project

Vin Malkoski, Diving Safety Officer

Overview

The Assessment and Survey Program includes four projects.

The **Resource Assessment Project** monitors the distribution, relative abundance, and size composition of marine fish and invertebrates in Massachusetts waters by conducting annual surveys utilizing consistent protocols. These include spring and fall statewide trawl surveys and a seine survey in certain south-facing Cape Cod estuaries. Survey data are used in assessments of numerous regional fish stocks, inform fishery management decisions, and contribute to evaluation of coastal alteration projects.

The **Invertebrate Fisheries Project** focuses on research and monitoring of commercially important marine invertebrates including American lobster, horseshoe crab, whelk, Jonah crab, and northern shrimp. Fishery-dependent and -independent surveys, as well as applied research projects, are conducted to characterize the populations of, and the fisheries for, these valuable species and to inform their management. Additional tasks include research grant writing and administration, and participation in ASMFC technical meetings.

The **Protected Species Project** is involved in various activities related to the conservation and management of protected species in Massachusetts waters. In 2014, this covered all efforts of the Large Whale Conservation Program, including oversight of the right whale surveillance program, acoustic monitoring of right whales, and large whale disentanglement. Project staff oversees and participates in work on other protected species, such as harbor porpoise and sea turtles. In 2014, these activities covered a range of issues such as the sea turtle disentanglement network,

participation in federal Take Reduction Teams, grant management, and potential risk of entanglement in subtidal aquaculture gear.

The **Scientific Diving Project** is responsible for the safe management of the scientific diving activities conducted by *MarineFisheries*. Operated in accordance with the Occupational Safety and Health Administration's scientific diving exemption, formal standards for training and dive operations afford *MarineFisheries'* divers better protection from accidental injury and/or illness. Since the Dive Project's inception, diving within *MarineFisheries* has markedly increased and contemporary diving and risk management procedures are warranted.

Resource Assessment Project

2014 Trawl Survey

The 37th spring and fall surveys were accomplished aboard the R/V *Gloria Michelle*. The spring survey completed 102 stations from May 5-22, while the fall survey completed 100 stations from September 2-18 (Figure 32).

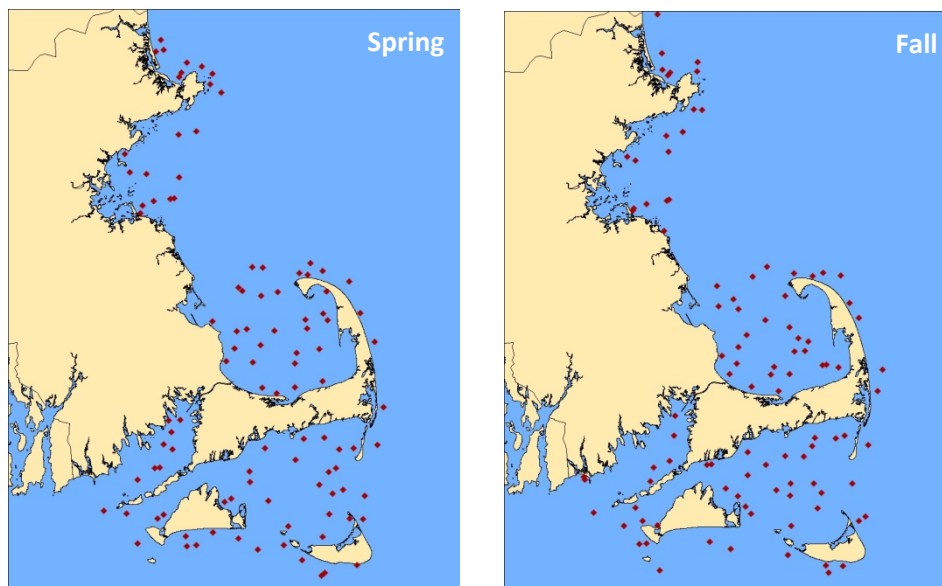


Figure 32. 2014 spring and fall trawl survey station locations.

The 2014 trawl surveys provided weights, counts, and measurements for 101 different species of fish and invertebrates (Figure 33). To aid cooperative fisheries assessments, survey crew collected over 2,700 age structures and sex and maturity observations from cod, haddock, fluke, yellowtail flounder, winter flounder, windowpane flounder, black sea bass, scup and tautog. Over 1,300 yellowtail and winter flounder were examined for parasitic lesions. Additional collections supported studies on range expansion of black sea bass, parasites in cod, condition and feeding ecology of haddock, cod and winter flounder, the biology and ecology of spiny dogfish, sexual dimorphism in black sea bass, and spatial structure of cod populations.

Project personnel contributed to committee work of the ASMFC's Northeast Area Monitoring and Assessment Program (NEAMAP), including the preparation of an annual update of trawl survey practices and results which was presented to the NEAMAP Board at the ASMFC Annual Meeting.

Project members serve on the following committees of NEAMAP: Operations, Data Management, and Trawl Technical.



Figure 33. Trawl survey crew empty the net onto the sorting table.

2014 Seine Survey

The 39th Nantucket Sound Estuarine Winter Flounder Young-of-Year (YOY) Seine Survey was completed between June 18 and July 3, 2014. The objective of this survey is to index winter flounder YOY abundance for the Southern New England stock; however, we count all commercially and recreationally-important finfish and invertebrates, and record presence/absence for all other species.

The trend in the annual index for YOY winter flounder is one of decline. The 2014 stratified mean index fell below the time series median. Forty species occurred in the 2014 seine survey hauls.

Assessment and Fisheries Management Support

Project personnel fulfilled requests for survey data to support various fisheries research, monitoring, and management initiatives both within the Division and at other government, consulting, and academic institutions. Survey data were provided to staff for inclusion in annual compliance reports for ASMFC-managed species. In 2014, survey data supported regional assessment efforts on haddock, cod, lobster, winter flounder, summer flounder, scup, and black sea bass.

V. Manfredi, serving as a member of the ASMFC Winter Flounder Technical Committee, prepared the annual ASMFC Winter Flounder Compliance Report and contributed to the Technical Committee's review of a fisheries habitat-use model applied to winter flounder. M. Camisa, as a member of the NEFMC Scallop PDT, summarized Massachusetts' state waters scallop permits and landings to aid in development of Framework 26.

Survey data provided to outside institutions in 2014 supported studies related to: lobster habitat and recruitment dynamics; effects of water quality and land use on nearshore fish populations; creation of an essential fish habitat geodatabase; and spatial modeling of alewife populations.

Invertebrate Fisheries Project

American Lobster Research and Monitoring

Commercial Lobster Trap Sampling: *Marine Fisheries* has worked cooperatively with Massachusetts commercial lobster trap fishermen to sample their catch since 1981. In 2014, the 34th year of operation, a total of 80 trips were conducted by staff of the Invertebrate Fisheries Project and the Fisheries Dependent Sampling Project, during which 45,363 lobsters were sampled from 16,392 trap hauls. This effort also includes shell disease monitoring, which tracks the incidence of shell disease symptoms on lobsters in Massachusetts coastal waters. In 2014, a total of 6,994 lobsters were sampled for incidence of shell disease. Sampling data were provided to the ASMFC and ACCSP.

Additionally, in the fall of 2014, a pilot effort was initiated to characterize finfish bycatch during commercial lobster trap sampling. Data collected during this pilot effort are being reviewed, and a standard protocol will be developed and implemented in 2015.

Ventless Lobster Trap Survey: This survey uses contracted lobstermen to deploy and haul lobster traps without escape vents and is a critical tool in monitoring and forecasting the abundance of lobster (and bycatch species). *Marine Fisheries* received funding for the 2014 season through a legislative appropriation, and initiated plans to increase commercial and recreational lobster permit fees in order to secure long-term financial support for the survey. The 2014 survey occurred during the normal time frame of June through September with eight contracted vessels (Figure 34). In Area 514, the survey provided 12,910 lobsters for sampling from a total of 2,855 trap hauls. In the southern survey area (Area 538 and northern Area 537), 6,050 lobsters were sampled from 1,967 trap hauls. Staff completed data entry and preliminary analyses, and will provide data to ASMFC and ACCSP.

T. Pugh was invited by the Massachusetts Lobstermen's Association to describe the Ventless Trap Survey's importance and operational details, and to demonstrate lobster sampling to State Representatives Josh Cutler and Vincent DeMacedo on a day trip with contracted lobstermen Fred and Wes Penney (Boston Harbor, F/V Sixpence).

A manuscript titled "Demographic patterns of American lobster (*Homarus americanus*) in Massachusetts Bay as documented by a ventless lobster trap survey," utilizing data from the pilot ventless trap survey years of 2005 and 2006 was prepared by authors T. Pugh and R. Glenn. This manuscript will be submitted to the Canadian Journal of Fisheries and Aquatic Sciences early in 2015.



Figure 34. Lobsters are sorted for sampling during the ventless trap survey.

Lobster Reproduction Studies: T. Pugh successfully defended her dissertation titled “The Potential for Sperm Limitation in American Lobsters (*Homarus americanus*) as Indicated by Female Mating Activity and Male Reproductive Capacity” and was awarded the Doctor of Philosophy degree in Zoology by the University of New Hampshire. A manuscript titled “Variation in the size and composition of ejaculates produced by male American lobsters *Homarus americanus* H. Milne Edwards, 1837 (Decapoda: Nephropidae)” resulting from this work was under review by the Journal of Crustacean Biology (co-authors: M. Comeau, K. Benhalima, and W. Watson) at year’s end, and additional manuscripts were under preparation.

Annual Early-Benthic-Phase Lobster Suction Sampling: *Marine Fisheries* completed the 20th year of this sampling program in 2014. The program is conducted in order to generate density indices of newly settled post-larval lobsters and delineate coastal habitat important to the settlement of these juveniles. A total of 23 coastal sites were surveyed in 2014 spanning Buzzards Bay, Cape Cod Bay, and Massachusetts Bay. Four South Shore stations between Hull and Marshfield were recently added to close spatial gaps in the survey and better monitor recruitment signals in Massachusetts waters.

Project staff conducted the SCUBA-based survey over 16 field days from mid-August to mid-October (Figure 35). Mean densities of young of year (YOY) lobsters were below time series means in all survey regions with the exception of the South Shore (Table 13).

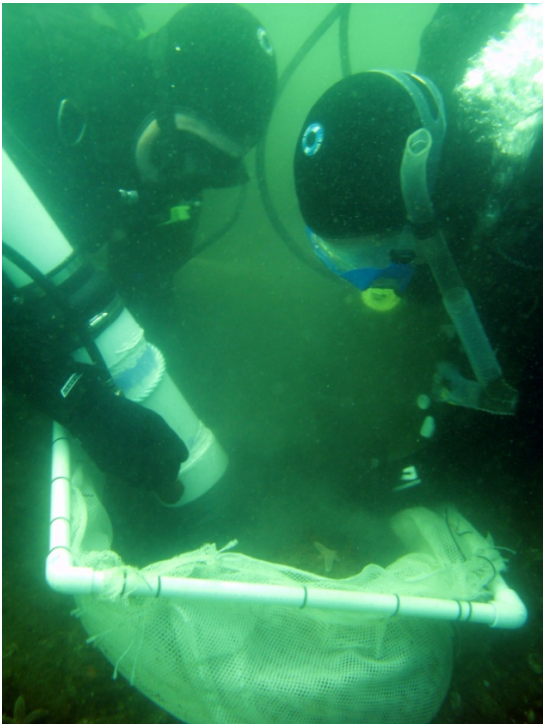


Figure 35. Division divers conducting suction sampling for early benthic phase

Table 13. Comparison of YOY lobster densities in 2014 and time series means by region.

Region (# yrs surveyed)	2014 YOY Mean	Time Series Mean
Cape Ann (5)	0.42	0.52
Salem Sound (19)	0.17	0.71
Boston (18)	0.06	0.16
South Shore (3)	0.12	0.07
Cape Cod Bay (20)	0.06	0.30
Buzzards Bay (20)	0.04	0.09
Vineyard Sound (5)	0.00	0.02

Assessment and Management Support: R. Glenn served as chairperson for the ASMFC American Lobster Stock Assessment (expected completion June 2015), and staff member T. Pugh served on the committee.

Northern Shrimp Research and Monitoring

Northern Shrimp Assessment Survey: In July and August, *Marine Fisheries* staff participated on several one-week legs of the 31st annual northern shrimp assessment survey conducted throughout the Gulf of Maine aboard the NOAA Ship R/V *Gloria Michelle*. For the third consecutive year, the survey indicated record low abundance of shrimp that will recruit to the fishery in the upcoming fishing season (Figure 36). The ASMFC Technical Committee recommended a 2014/2015 harvest moratorium based on the 2014 survey and assessment results, and noted that recently-observed unfavorable water temperatures may contribute further to poor recruitment.



Figure 36. Male and female stages of northern shrimp sampled in the annual Northern Shrimp Assessment Survey.

Commercial Fishery Sampling: The ASMFC continued the interstate harvest moratorium erected for the 2013/2014 northern shrimp fishing season into the 2014/2015 season; consequently, *Marine Fisheries* could not conduct any commercial catch sampling. However, in the absence of fishery-dependent data, staff coordinated the collection of research samples by a Massachusetts vessel contracted to perform test tows. The effort was funded by ASMFC and authorized through an interstate 25-mt research set-aside. *Marine Fisheries* staff processed the research samples to evaluate egg hatch timing, size frequencies, and developmental stages of shrimp from the southern portion of the stock. Results were reported to the ASMFC Technical Committee and compared to test tow results from three other Gulf of Maine regions.

Assessment and Management Support: As chairperson of the ASMFC Northern Shrimp Technical Committee, K. Whitmore helped to prepare the 2014 ASMFC Northern Shrimp Stock Status Report, and presented the assessment to the ASMFC Northern Shrimp Section. Whitmore also participated on the ASMFC Northern Shrimp Plan Development Team, which in 2014 worked to develop a public information document for Draft Amendment 3 to the interstate plan.

Horseshoe Crab Monitoring

Commercial Fishery Sampling: Monitoring of the commercial bait and biomedical harvests continued in accordance with the interstate FMP. Prosomal width measurements were obtained from 1,199 crabs during sampling from a local dealer and a biomedical facility. In addition, prosomal width measurements were obtained from 159 crabs during sea sampling trips aboard fishing vessels in Nantucket Sound.

Fisheries Independent Surveys: Annual volunteer-based spawning surveys continued at 16 beaches along the South Coast, Cape Cod, and the islands. *Marine Fisheries* staff conducted 20 surveys at Swift's Beach in Wareham, MA. The 2014 survey infrequently observed horseshoe crabs, but comparisons between years cannot be made due to changes in survey protocol in 2014. The 2015 survey will revert back to the modified Delaware Bay Survey design, which was used from 2008-2013.

Staff members spent 12 days exploring methods to conduct a juvenile horseshoe crab survey in Wellfleet Harbor. While juvenile abundance was low, this effort will continue in 2015 and will likely be expanded into Nantucket Sound.

Other Activities: D. Perry participated as a member of the ASMFC Horseshoe Crab Technical Committee. *Marine Fisheries* biologists accepted meeting invitations from the Massachusetts Audubon Society, Horseshoe Crab Conservation Association, and a group of citizens representing Wellfleet Harbor to discuss horseshoe crab biology, population monitoring, and management. At the request of concerned citizens, a staff biologist spent three days in the fall inspecting reports of "dead" horseshoe crabs washed up on south facing Cape Cod beaches. Staff observed large numbers of molt casts, but no dead crabs.

Whelk Research

Marine Fisheries continued investigating the biology of and fisheries for whelk in the waters of the Commonwealth. Staff fabricated whelk measuring gauges which were given to industry members in exchange for filling out an anonymous survey about their perception of the whelk fishery. There were 62 respondents that actively fished their whelk traps in 2013. Of these fishermen, 13% felt the resource was in excellent condition (no concerns), 27% felt it was in good condition (minor concerns), 37% felt it was in fair condition (concerned), and 23% felt it was in poor condition (very concerned). This survey provided a unique opportunity to understand individual industry members' views of the fishery.

With the increased attention on the need to reduce green crab populations coupled with concerns over using horseshoe crabs as bait, *Marine Fisheries* developed a comparative bait study to evaluate catch rates of whelk using green crabs in the whelk trap fishery. A pilot study was planned for the 2015 season. *Marine Fisheries* also collaborated with ASMFC to develop a study to test an artificial bait for use in the whelk trap fishery. Unfortunately, after completing study design and selecting industry participants, the study was put on hold indefinitely because the manufacturer of the artificial bait did not supply the product as agreed upon.

Jonah Crab Research

Traditionally considered bycatch of the American lobster fishery, Jonah crab ([Figure 37](#)) is now a targeted species and its fishery has recently become one of the top ten most valuable in the state. In 2014, almost 12 million pounds of Jonah crab were landed in Massachusetts with a value of over \$9.3 million. Massachusetts is the nation's leading supplier of Jonah crabs ([Table 14](#)).

Our biologists measured and sexed nearly 5,000 Jonah crabs from November 2013 to December of 2014 as part of a new dockside sampling program. The sampled catch was comprised of mostly males (>99%) and crabs over 5 inches in carapace width (>99%). The average crab was 5.7 inches; the largest, 6.7 inches. Sampled crabs were landed by both inshore and offshore boats fishing in multiple statistical reporting areas.

Table 14. Average percent of Jonah crab landings by state, 2010-2013 (Source: NOAA Commercial Fisheries Statistics)

State	% of Landings
Massachusetts	62.0
Rhode Island	28.4
Maine	6.7
New York	1.7
New Hampshire	0.7
New Jersey	0.3
Connecticut	0.1
Maryland	0.1



Figure 37. Jonah crab, *Cancer borealis*.

Until recently, Jonah crab management was limited to some permitting restrictions in Maine, New Hampshire, and Massachusetts. In October 2014, the ASMFC Lobster Management Board voted for the development of an interstate Jonah crab FMP. *MarineFisheries* staff will be involved with its development, and will also continue to participate in the Jonah crab Fisheries Improvement Project (FIP). The FIP working group consists of fishermen, processors, seafood dealers, retailers, non-governmental organization representatives, academia, and state and federal managers and scientists, collaborating with the goal of promoting sustainable harvest of Jonah crab.

Staff also collaborated on several research funding proposals to study Jonah crab size-at-maturity. While one proposal was not funded, another proposal submitted to the NMFS Saltonstall-Kennedy Grant Program, in collaboration with the Commercial Fisheries Research Foundation and the Atlantic Offshore Lobstermen’s Association, was awaiting notification of acceptance at year’s end.

Great Marsh Green Crab Depletion Program



Figure 38. A green crab in shallow water observed by *MarineFisheries* divers.

In the fall of 2014, *MarineFisheries* staff administered a program to remove green crabs (*Carcinus maenas*) from the Great Marsh, a large stretch of salt marsh located along the North Shore of Massachusetts. This program was developed to address local concerns that fisheries resources were being threatened due to recent expansions of the green crab population (Figure 38). Green crabs are known predators of soft shell clams (*Mya arenaria*) and other shellfish. In large numbers, the crabs’ extensive burrowing activity can also result in degraded habitats including eelgrass beds and saltmarsh. To reduce green

crab numbers, North Shore municipalities were offered “bounties” for the removal of green crabs from estuaries and near shore shallow waters. The Towns of Ipswich and Essex participated in the depletion program, where fishermen trapped a total of 70,100 lbs of green crabs from late September through mid-November.

Bottom Temperature Monitoring

MarineFisheries maintains nine permanent temperature monitoring stations in water between 5 and 30 meters deep from Boston Harbor to Southern Buzzards Bay (Figure 39). Monitors are usually deployed in the summer and record bottom temperature every two hours until they are retrieved the following summer. Many of the stations have been collecting data for over 25 years, making these data sets among the longest running bottom temperature time series in the northeast. Data from these monitors are valuable in detecting environmental change in Massachusetts waters. For example, temperature data from southern New England have shown a warming trend which helped to explain changes in population dynamics of some cold-water species, including American lobster.

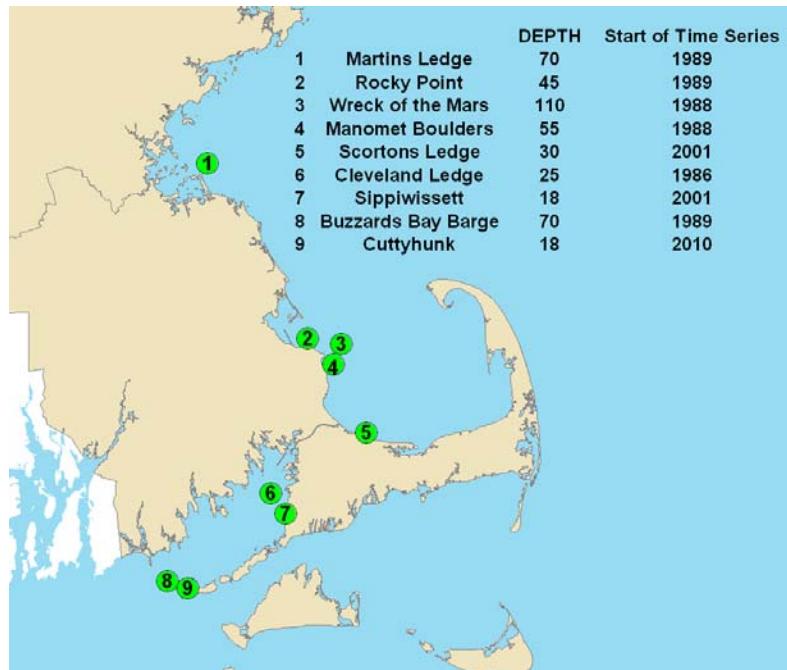


Figure 39. Map of *MarineFisheries* temperature monitoring stations (depth given in feet).

During the summer of 2014, *MarineFisheries* divers retrieved and replaced temperature monitors at all nine stations. These monitors contained data from late 2013 to the summer of 2014. The data show that the recent warming trend has continued; 2013 was one of the warmest years recorded. Temperature records broken in 2013 included the highest recorded daily mean temperature at Sippiwissett (26.2 °C, previously 25.7 °C (2002)), and Scortons Ledge (21.1 °C, previously 20.2 °C (2002)). The Buzzards Bay Barge, Sippiwissett, Manomet Boulders, and Rocky Point each had their second highest mean annual temperature in 2013;

only 2012 was warmer for each location. In 2014, January through April mean monthly temperatures were below time series means for every station with longer than a 15 year time series (Cleveland Ledge, Buzzards Bay Barge, Manomet Boulders, Wreck of the Mars off Plymouth, Martins Ledge, and Rocky Point). However, with the exception of the Wreck of the Mars, these stations all had mean monthly temperatures above time series means for May and June.

Other Activities

R. Glenn served on a steering committee for the Commercial Fisheries Research Foundation (CFRF) Lobster Research Fleet Pilot Project. This project is designed to explore and test new technologies that will enable lobstermen fishing in Lobster Management Areas 2 and 3 to collect and relay much-needed biological data to managers and scientists monitoring the lobster stock in these areas.

Staff members contributed manuscript reviews to the Canadian Journal of Fisheries and Aquatic Sciences, the Journal of Shellfish Research, and PLOS One.

T. Pugh attended the 10th International Conference and Workshop on Lobster Biology and Management, where she presented two talks and one poster: “Patterns in demographics of American lobster (*Homarus americanus*) in coastal waters - Massachusetts Bay – USA” (talk); “Overwhelming odds? Male mating success when dwarfed or outnumbered by female partners” (talk); and “Spermatophores produced by electro-stimulation of male lobsters (*Homarus americanus*) vary in size and content” (poster).

R. Glenn attended the 2014 International Shellfish Restoration Conference in Charleston, S.C. where he presented a talk titled “An overview of the channeled whelk (*Busycotypus canaliculatus*) fishery in Massachusetts”.

R. Glenn and K. Whitmore attended the annual American Lobster Settlement Index collaborative meeting in Maine. They presented on changes to Massachusetts sampling stations throughout the 20 years of survey, as well as trends in the Massachusetts young-of-the-year-index and recent work indicating reliability in predicting landings trends from this index moving forward.

Protected Species Project

Cape Cod Bay Right Whale Surveillance Program

In 2014, *Marine Fisheries* partnered with the Provincetown Center for Coastal Studies (PCCS) and NOAA Fisheries to carry out the 16th year of the Cape Cod Bay Right Whale Surveillance Program. The program conducts aerial surveillance and habitat monitoring of right whales in Cape Cod Bay Critical Habitat.

The trend of increased abundance of right whales in Cape Cod Bay continued in 2014. Of the catalogued right whale population, at least 48% (n=253) of the estimated 522 right whales known to be alive were documented by PCCS in Cape Cod Bay and adjacent Massachusetts waters (Figure 40). Of the 11 calves known to have been born during the 2014 season, three were documented with their mothers in Cape Cod Bay or adjacent areas.

The number of whales observed in 2014 was consistent with the pattern of increased prevalence observed since 2007. Habitat monitoring in 2014 revealed abundant food resources in the southern part of the bay which was reflected in whale distribution. The continued pattern of increased prevalence of right whales illustrates how important Massachusetts waters are to the North Atlantic population.

E. Burke administered the grant from NMFS that supports aerial surveillance and habitat monitoring and assisted in coordination of large whale conservation activities.

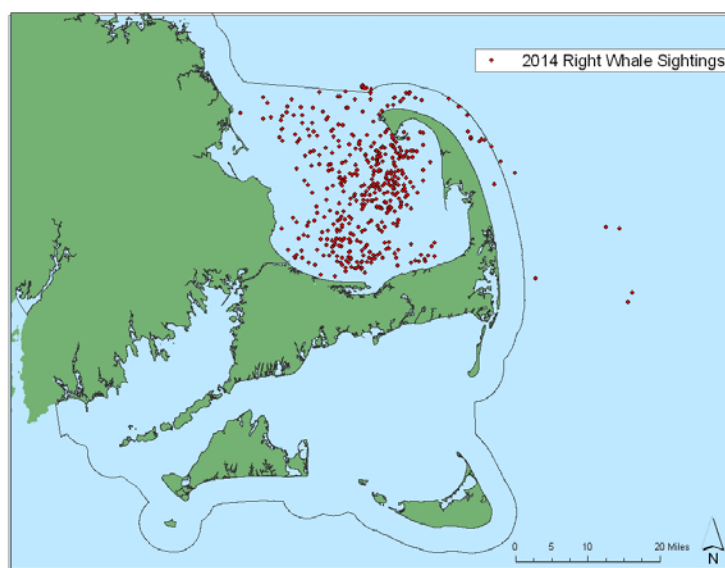


Figure 40. Map of 2014 right whale sightings (PCCS aerial data)

Atlantic Large Whale Take Reduction Plan

In June 2014, NMFS enacted amendments to the Atlantic Large Whale Take Reduction Plan that significantly affected trap/pot fishermen in Massachusetts. These changes included a prohibition on fishing single traps in non-exempt waters of the Northeast and a closed season from January 1 to April 30 in the Massachusetts Bay Restricted Area. Project staff spent considerable time working to address the concerns of the fishing industry regarding these new restrictions. This included submission of written comment letters to NMFS expressing our concerns with the safety and equity of the new rule. Staff also drafted an exemption request to NMFS asking for changes to the ban on single pots, the gear marking scheme, and the timing and area of the closed season. In anticipation of the Take Reduction Team meeting in January 2015, project staff analyzed entanglement data to examine the impact of single pots entanglements relative to overall entanglements. This information played a key role in our rationale supporting the exemption. Staff also conducted outreach to the fishing industry about the exemption request at meetings in Gloucester and Chatham, and through numerous emails and phone conversations. Staff then assisted in presentation of the exemption request and its rationale at the Take Reduction Team meeting. These efforts were instrumental to NMFS' ultimate approval of the *Marine Fisheries'* single trap exemption request, which brought relief to the fishing industry while maintaining a conservation benefit to large whales.

Large Whale Disentanglement Network

Marine Fisheries and PCCS cooperatively administer large whale disentanglement efforts around Massachusetts through a grant from NMFS. Of the 21 whale entanglement cases documented in 2014 along the U.S. and Canadian coasts, 14 were observed off the coast of Massachusetts – seven right whales, two humpback whales, three fin whales and two minke whales. Only one of those cases was fully resolved – a minke whale that was disentangled from a lobster pot trawl outside Boston Harbor. Relatively few of the remaining cases were in a position to be resolved, either due to time of day, distance from shore, or status of the entanglement. The origin of these entanglements is unknown. Project staff performed grant management and assisted in investigating gear retrieved from entangled animals.

Leatherback Sea Turtle Disentanglement

Marine Fisheries has partnered with PCCS on the Leatherback Sea Turtle Disentanglement Program in Massachusetts since 2005. Leatherbacks are seasonal visitors to Massachusetts waters, where they feed on gelatinous zooplankton and are known to become entangled in vertical lines associated with fixed fishing gear (Figure 41). In 2014, there were 26 confirmed entanglement cases, which is above the time series median (20), but fewer than the record high number of cases observed in 2012 and 2013 (37 and 51, respectively). Project staff assisted in disentanglement efforts, gear analysis, and performed all grant management activities.



Figure 41. Leatherback turtle entangled in buoy line in Nantucket Sound (PCCS photo)

Other Activities

E. Burke participated as a member of the Massachusetts Habitat Working Group. This body assists EEOEA, BOEM and the Massachusetts Clean Energy Center with analysis of natural resource data as it relates to potential impacts in the Massachusetts Wind Energy Area (WEA). State and federal governments are assessing the area south of Martha's Vineyard and Nantucket for future offshore wind energy development. Burke advised the Habitat Working Group on monitoring whales, marine turtles, and other potential protected species in the WEA. Burke also participated in meetings related to updating the Massachusetts Ocean Management Plan, lending expertise relevant to aquaculture, whales, and turtles.

Project staff provided guidance to *Marine Fisheries* shellfish personnel and municipal shellfish authorities on the potential impacts of subtidal aquaculture projects on protected species. Entanglement in ropes is a major cause of injury and mortality for endangered large whales and sea turtles. The potential for subtidal aquaculture gear to increase entanglement risk should be carefully considered when developing and licensing these projects, especially if they fall within the boundaries of Right Whale Critical Habitat. Project staff also participated in two dive investigations of subtidal aquaculture sites in state waters to evaluate the profile and configuration of the gear. In addition, project staff participated in a NMFS regional task force to look at aquaculture and protected species issues.

Marine Fisheries conducted outreach and education efforts on protected species issues in the Commonwealth. The majority of these efforts focused on the recent amendments to the Large Whale Take Plan that affect vertical lines, as well as conducting outreach about entanglement issues in Massachusetts.

Scientific Diving Project

Marine Fisheries' scientific divers conducted over 500 research dives in 2014 to support on-going research and monitoring programs, including artificial reef site surveys; benthic temperature monitoring; early-benthic-phase lobster suction surveys; eelgrass monitoring and restoration; shellfish abundance and habitat surveys; maintenance of acoustic telemetry receivers; PCB monitoring sample collection; and dive program training (Figure 42).

Routine program management duties included diver training, equipment maintenance and repair, and maintenance of the air system.

Educational and outreach efforts to dive clubs, schools, and local dive shows continued. Highlights included a *Marine Fisheries* booth at the Boston Sea Rovers Clinic, DUI Dry Suit Event, and the Beneath the Sea Show in New Jersey. The Division also hosted the 2014 North American Our-World Underwater Scholar, Ana Sofia Guerra from Mexico, in September and October.



Figure 42. *Marine Fisheries* scientific divers

Other Activities

The Assessment and Survey Program Manager served as a member of the NEFMC Groundfish, Monkfish and Atlantic Herring Plan Development Teams. In that role, he generated analyses to support development of Frameworks 51, 52 and 53 as well as Amendment 18 to the Groundfish FMP and Amendment 6 and Framework 8 to the Monkfish FMP.

During 2014, the Program Manager continued to serve as chair of ASMFC Winter Flounder Technical Committee, and member of the Assessment Science Committee and NEAMAP Analytical Committee. He continued to provide technical assistance on sampling designs and statistical analyses on an as-needed basis to other *Marine Fisheries* projects and graduate students.

The Program Manager co-authored a paper entitled “From Fishing Capacity to Diversity: Changing Fishery Management Priorities in the New England Groundfish Fishery”. This paper was presented at the 2014 International Institute of Fisheries Economics & Trade Conference and will be published in the conference’s proceedings. He also submitted a paper on measuring diversity in the New England Groundfish fishery for publication in *Marine Policy*. He presented a paper comparing cod catches from the systematic grid design and industry hot-spot design components of the cod industry-based survey to the Marine Fisheries Institute’s review of groundfish stock assessments.

Recreational and Diadromous Fisheries Program

Personnel

Dr. Gregory Skomal, Program Manager

Recreational Fisheries Project

Dr. Gregory Skomal, Senior Marine Fisheries Biologist, Project Leader

John Boardman, Marine Fisheries Biologist

Matt Ayer, Marine Fisheries Biologist

Ross Kessler, Public Access Coordinator

David Martins, MRIP Coordinator

Large Pelagics Research Project

Dr. Gregory Skomal, Senior Marine Fisheries Biologist, Project Leader

John Chisholm, Marine Fisheries Biologist

Diadromous Fisheries Project

Brad Chase, Senior Marine Fisheries Biologist, Project Leader

John Sheppard, Marine Fisheries Biologist

Dr. Michael Bednarski, Marine Fisheries Biologist

Ben Gahagan, Marine Fisheries Biologist

Edward Clark, Carpenter

Overview

The Recreational and Diadromous Fisheries Program includes the Recreational Fisheries Project, the Large Pelagics Research Project, and the Diadromous Fisheries Project.

The purpose of the **Recreational Fisheries Project** is to preserve, enhance, and promote the marine recreational fisheries of the Commonwealth. Goals are to conserve key recreational species through science-based management; support the recreational fishing community, including local recreational fishing businesses; and educate the Commonwealth's citizens of the features and benefits of local recreational fisheries resources. Project personnel measure abundance, length frequency, and age classes of key finfish populations for input to stock assessments and to design and analyze management options; assess habitat and prey needs of key species; measure harvest and release of key species; promote and enhance recreational fishing access through the purchase and maintenance of access sites; and disseminate information on all aspects of recreational species and fisheries to the public.

Since 1987, the **Large Pelagics Research Project** has been conducting research to enhance our understanding of the ecology, life history, and relative abundance of sharks, tunas, and billfish off the coast of Massachusetts, where extensive recreational fisheries for these species occur. In addition to this research, the goals of the Large Pelagics Research Program are to foster cooperative research; to participate in the state, regional, and federal management process; and to provide public education and technical information on the biology, management, and utilization of highly migratory species.

The **Diadromous Fisheries Project** is comprised of two major initiatives: fish passage and restoration, and fish biology and management. The former is coordinated among *Marine Fisheries* staff, state and federal agencies, municipalities, and private groups to facilitate, design, and execute restoration projects with the goal of enhancing diadromous fish populations and habitats. In addition, technical assistance and monitoring are provided as needed for individual restoration projects and coastal watersheds. The latter is responsible for the management, investigations, and assessment of over 10 species of diadromous fish stocks in Massachusetts. Species such as river herring (alewife and blueback herring), rainbow smelt, white perch, tomcod, American eel, and American shad are evaluated for run counts, indices of population abundance, size and age composition, local harvests, and restoration potential. Information generated by this project is necessary for the sustainable management of diadromous fish populations as required by state and federal law.

Recreational Fisheries Project

MRIP Sampling Project

Since 1983, recreational fisheries catch and harvest data have been collected along the Atlantic Coast through NOAA Fisheries' Marine Recreational Information Program (MRIP). *Marine Fisheries* has managed the at-sea head boat survey segment for Massachusetts waters since 2003, and assumed the shore-side sampling of charter vessels, shore anglers, and private/rental vessel anglers in 2013. The benefits of doing so include the ability to increase sample sizes and the precision of catch estimates.

In 2014, *Marine Fisheries* continued its coordination of these MRIP surveys—training personnel, scheduling trips, logging data, maintaining equipment, attending data review meetings, and maintaining regular communication with the contractor to NOAA Fisheries, Research Triangle Institute, regarding survey performance and sampling. During 2014, 68 head boat sea sampling trips were completed for a total of 112 sampler days and 1,238 angler intercepts (Figure 43). For shore-side sampling, our MRIP field interviewers completed 1,141 assignments (226 shore angler and 915 private/rental/charter boats) with 2,769 angler intercepts. Of these, 1,706 were from private vessels, 314 from charter vessels, and 749 from shore anglers. To improve awareness about the project, staff presented the new survey methodology to numerous fishing clubs and similar organizations early in the year.



Figure 43. Technicians aboard a for-hire vessel interview anglers and measure catch for future stock assessments.

Recreational Fishing Derby

Project staff administered *Marine Fisheries*' Saltwater Fishing Derby. The derby, formally known as the Governor's Cup hosted by the Division of Tourism, was moved to *Marine Fisheries* in 1983. Activities in 2014 included regular communications to weigh stations, preparing press releases for derby promotion and announcement of winners, logging certified weigh-in shops, and tracking

derby standings in a database. Winners would be recognized with awards at the annual New England Boat Show in 2015. The catch and release derby component was promoted with outreach materials and press releases. Project personnel created, printed, and distributed rule pamphlets and minimum size rulers.

Recreational Species Research, Assessment, and Management

Policy, Technical Committee, and Stock Assessment Support: *Marine Fisheries* added a new position, Stock Assessment Specialist, in 2014; this position was filled by Michael Bednarski. This position is funded through funds collected by the Massachusetts Saltwater Fishing Permit. The Specialist's primary objective is to contribute technical and analytical support as needed and to work with interstate collaborators to provide recommendations and create options likely to foster sustainable fisheries for key recreational species.

Dr. Bednarski's tasks for 2014 focused on participating on ASMFC technical and MAFMC monitoring committees for scup, summer flounder, black sea bass, and bluefish, as well as ASMFC technical committees for weakfish and tautog. Through these committees, contributions are made to regional/coastwide stock assessments and management plans. Local fishery performance was also reviewed and potential bag, size, and season restrictions assessed for scup, summer flounder, and black sea bass. Additionally, staff prepared and submitted ASMFC compliance reports for each of these species.

Summer Flounder Tagging: *Marine Fisheries* initiated a tagging study for summer flounder in 2009. The primary purpose of the study is to examine migratory timing and pathways and determine if summer flounder exhibit inter-annual homing. During 2014, staff conducted four summer flounder sampling trips on *Marine Fisheries* research vessels, tagging 184 fish, for a total of 1,428 summer flounder tagged over six years. Since the study began, 82 tags have been returned from recreational and commercial fishermen along the east coast.

Multi-year tag returns indicated that inter-annual site fidelity in Massachusetts is a rare occurrence. Whether this is due to the intensity of the winter fishery cropping off potential returning fish or a change in the migratory patterns of older and larger fish is not clear at this time. There is, however, some anecdotal evidence of the latter, as larger fish, which have become increasingly rare in the local inshore recreational fishery catch, have been noted in catches of anglers further to the north and east in colder water. In 2015, staff plans to look into approaches, such as state-transition modeling, to quantitatively assess the ultimate fate of summer flounder initially recorded in Massachusetts.

The length frequency data collected during the study are also used to project recreational harvest under different minimum size limits. Little other data for this type of analysis are available.

Public Access

The *Marine Fisheries* Public Access Coordinator, a position held by Ross Kessler, is funded from the Marine Recreational Fisheries Development Fund. The Coordinator manages all *Marine Fisheries* saltwater fishing access projects, working closely with the Office of Fishing and Boating Access (OFBA), NGOs, towns, and other state and federal agencies to identify, plan, and implement construction/renovation/improvement of new fishing piers and other structures for fishing access. He also serves as a liaison to the fishing public for all matters of saltwater fishing access including advocating for beach and shore access.

In 2014, *Marine Fisheries* worked with OFBA to complete a new fishing pier in Oak Bluffs; replace the stairs to the Popponesset fishing access location owned by the Department of Fish and Game (Figure 44); permit and complete improvements to the Dogfish Bar Fishing Access Site in Aquinnah; finalize plans to rebuild the fishing pier at Cashman Park in Newburyport; perform engineering and contracting to build a fishing pier in the Town of Fairhaven; and replace ramp floats at the state boat ramp in Westport. In addition, *Marine Fisheries* collaborated with MassDCR to refurbish the Scusset Fishing Pier on the Cape Cod Canal, and with Massachusetts Natural Heritage Program to write a Habitat Conservation Plan for alternate management options in piping plover habitat.

Kessler also worked with USFWS, The Trustees of Reservations, the Massachusetts Water Resource Authority, local municipalities, and several NGOs including the Massachusetts Striped Bass Association, Mass Audubon, the Barnstable County League of Sportsmen, the Plymouth County League of Sportsmen, the Stellwagen Bank Charter Boat Association, and the Massachusetts Beach Buggy Association. Proposals were developed for several access sites of interest for 2015 and 2016 expenditures from the Marine Recreational Fisheries Development Fund.

In 2014, *Marine Fisheries* launched a small grant program to assist local towns with small public access projects. This program allows for municipalities to apply for grants that fund projects promoting or supporting recreational fishing activities and access in their towns. In the first year of the program, five projects were funded in Rockport, Quincy, Duxbury, Fall River, and Swansea.

At the *Marine Fisheries* Craven's Landing access site on Scorton Creek in Sandwich, periodic site monitoring and maintenance were required. A major improvement to the parking area at Craven's landing included filling and graveling so as to stop tidal flooding on all but the highest tides. A seasonal contractor was hired for site patrol and coordinated for weekly summer assignments. For the fourth consecutive year, a brief closure of Craven's Landing was necessary due to the presence of federally protected piping plovers. When piping plover chicks are present, *Marine Fisheries* works closely with Mass Audubon to comply with USFWS regulations. Access is limited at Craven's Landing after the plover chicks are born and re-opened when Mass Audubon determines that the young plovers are no longer in danger. The plover-related closure during the summer of 2014 was the shortest in the last four years.

In 2014, Kessler responded to numerous inquiries regarding shore-side fishing access sites, public access rights, and future public access projects. He attended fishing related trade shows including: the Standish Sportsmen's Show, the New England Fishing and Outdoor Expo, the New England Boat Show, the New England Saltwater Fishing Show, and the Massachusetts Striped Bass Association Annual Sport Fishing Expo.



Figure 44. New public access stairs in Popponesset.

Outreach

Staff routinely answered public inquiries regarding recreational fisheries, attended meetings of the recreational fishing community, and delivered public presentations on fisheries management and program research to organized groups such as local schools and fishing clubs.

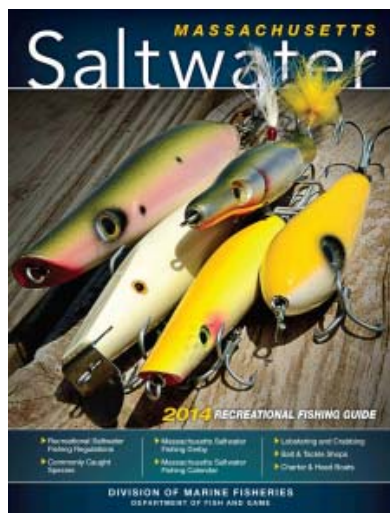


Figure 45. The cover of the 2014 fishing guide.

In 2014, informational materials were distributed at the Standish Sportsman's Show, Worcester Sportsman's Show, Rhode Island Saltwater Anglers Association Fishing Expo, Massachusetts Striped Bass Association Fishing Expo, New England Boat Show, and Topsfield Fair. The following fishing club general membership meetings were regularly attended to present information regarding Project jobs and/or public hearing proposals: Cape Cod Salties Sportfishing Club, Barnstable County League of Sportsmen, Plymouth County League of Sportsmen, Bristol County League of Sportsmen, Stellwagen Bank Charter Boat Association, League of Essex County Sportsmen, and Osterville Anglers Club.

The Massachusetts Saltwater Recreational Fishing Guide (Figure 45) was prepared and distributed at the above listed shows, over 140 bait and tackle shops, similar locations along the coast, and to requesting anglers by mail and website downloads. In addition, an e-mail based newsletter – *The Broadcast* – was distributed to permit holders via e-mail.

Habitat

Routine communication regarding local fisheries resources and fisheries activity was maintained with Environmental Review Program staff. This included technical assistance to permit review staff on projects related to diadromous and recreational fish resources, including artificial reef site evaluations.

Large Pelagics Research Project

Massachusetts Sport Fishing Tournament Monitoring Program

To better characterize the relative abundance of sharks, tunas, and marlins off the coast of Massachusetts, *Marine Fisheries* has been collecting catch and effort data at fishing tournaments since 1987. The program strives to rectify biases in the calculation of catch-per-unit effort indices from tournament data by surveying tournament participants and working with organizers to collect complete catch information (all fish landed, tagged, released, and lost).

In 2014, Project staff obtained data from three tournaments (Table 15). The tournament database was updated, and data summaries were distributed to tournament organizers and participants, as well as NOAA Fisheries (for inclusion in the federal tournament monitoring program). Massachusetts big game tournament fishermen spent a minimum of 799 boat hours fishing for sharks, tunas, and billfish in 2014. Program personnel tallied 183 fish comprising nine species. Size data were collected from 158 fish boated during the 2014 events.

Table 15. 2014 Massachusetts offshore fishing tournaments.

Tournament	Species	Dates	# Boats	Boat Hrs.
Falmouth Grand Prix	Mixed	7/18-19	18	306
North Atlantic Shark Tournament	Shark	7/18-19	14	238
Oak Bluffs Bluewater Classic	Mixed	7/24-26	15	255
Total				799

Massachusetts Shark Research Program

Marine Fisheries established the Massachusetts Shark Research Program in 1989 to more fully elucidate the ecology, distribution, and relative abundance of sharks subjected to fisheries off the coast of Massachusetts. The program conducts field research and opportunistically collects information and samples from recreational and commercial fishermen. Biological parameters including age, feeding ecology, movements, and reproductive status are examined through dissection and tagging of sharks. The program's goals are to: foster cooperative shark research; participate in state, regional, and federal management processes; and provide public education and technical information on the biology, management, and utilization of sharks.

With the exception of trawl, longline, and gillnet fisheries that target spiny dogfish (*Squalus acanthias*), there are no directed commercial fisheries for sharks in Massachusetts. Of the 9.47 million pounds of sharks landed in 2014, the vast majority were spiny dogfish (9.44 million pounds). The balance consisted of shortfin mako (*Isurus oxyrinchus*) taken incidentally.

A substantial recreational fishery for sharks occurs in Massachusetts from June through October each year. Harvest estimates from NOAA Fisheries' MRIP indicate that Massachusetts' recreational fishermen caught about 126,000 sharks in 2014, with spiny and smooth dogfish comprising 92% of the catch (Table 16). However, while MRIP data reflect those species commonly taken by shore-based and coastal fishermen, they do not adequately represent the species composition, relative abundance, and temporal and spatial distribution of sharks targeted by fishermen in offshore waters. The NOAA Fisheries Large Pelagic Survey (LPS), which is more reflective of offshore fisheries, reported 2,576 sharks taken by Massachusetts recreational fishermen in 2014, comprising blue (*Prionace glauca*, 2,059), shortfin mako (336), common thresher (*Alopias vulpinus*, 166), and porbeagle (15) sharks; overall, 90% were released (Table 16).

Table 16. Estimates of 2014 recreational shark landings (numbers) in Massachusetts.

Source	Species	Boated	Released	Total	Percent Released
LPS	Blue		2,059	2,059	100
	Shortfin Mako	92	244	336	72.6
	Common Thresher	139	27	166	16.3
	Porbeagle	15		15	0
	Total	246	2,330	2,576	90.5
MRIP	Spiny Dogfish	2,056	82,133	84,189	97.6
	Smooth Dogfish	1,538	30,570	32,108	95.2
	Blue	3,449	2,977	6,426	46.3
	Shortfin Mako	3,499		3,499	0
	Total	10,542	115,680	126,222	91.6

Taken together, these data sources indicate that recreational fishermen captured six different species of sharks in the coastal and offshore water of Massachusetts. The species composition reported by each data source largely reflects the extent to which each survey sampled coastal/shore-side or offshore fishermen.

Movement and Habitat Studies: With external funding from private and federal grants, Shark Research Program personnel continued in 2014 to collaborate with federal and academic researchers on the study of broad and fine-scale movements of numerous shark species using pop-up satellite tags, real-time satellite tags, acoustic transmitters, and conventional tags. These species include white, basking, blue, shortfin mako, tiger, and sand tiger sharks.

Basking Shark: Since 2004, 57 basking sharks have been tagged with PSAT tags and 10 with SPOT tags. The broad- and fine-scale horizontal and vertical movements of this species are being examined by Tobey Curtis as part of his PhD project at SMAST. In 2014, Tobey completed a quantitative analysis of the fine-scale movements of SPOT-tagged basking sharks as they relate to oceanographic features derived from satellites (Curtis et al., 2014).

White Shark: While known to be relatively rare in the Atlantic, the number of seasonal (summer/early fall) white shark sightings off the coast of Massachusetts has been rising in recent years. There has also been an increase in the reports and evidence of white shark attacks on seals, largely adjacent to Monomoy Island off the coast of Cape Cod, which hosts a sizeable and growing population of gray seals. White sharks, which were thought to generally feed offshore in the Atlantic, are exhibiting a dietary shift in response to changes in seal abundance. For the first time, we now have predictable access to white sharks in the North Atlantic.

From 2009 through 2014, a total of 56 individual white sharks were tagged off the eastern coast of Cape Cod, primarily in nearshore shallow waters from Orleans to the southern tip of Monomoy. Five of these sharks were tagged in partnership with the non-profit organization, OCEARCH, in 2012 and 2013. These five sharks—the first to be tagged with real time satellite transmitters in the Atlantic Ocean—can be followed live through OCEARCH’s interactive tracking website. The remaining sharks were tagged with one or more of the following tags: pop-up satellite archival tags, coded acoustic transmitters, autonomous underwater vehicle transponders, active acoustic transmitters, and NOAA Fisheries conventional tags. The 56 tagged sharks ranged from roughly 7.5 to 18.5 feet in total length.

In 2014, project personnel initiated a study to quantify the regional population size of white sharks in Massachusetts waters. With funding and logistical support from the Atlantic White Shark Conservancy, a formal survey was conducted from mid-June through October off the southern coast of Cape Cod. In total, 68 individual white sharks (43 males, 25 females) were identified. Of these, 18 were tagged with acoustic transmitters. Over the course of the summer and fall, 22 white sharks were detected by the *MarineFisheries* acoustic array off Cape Cod (Figure 46).

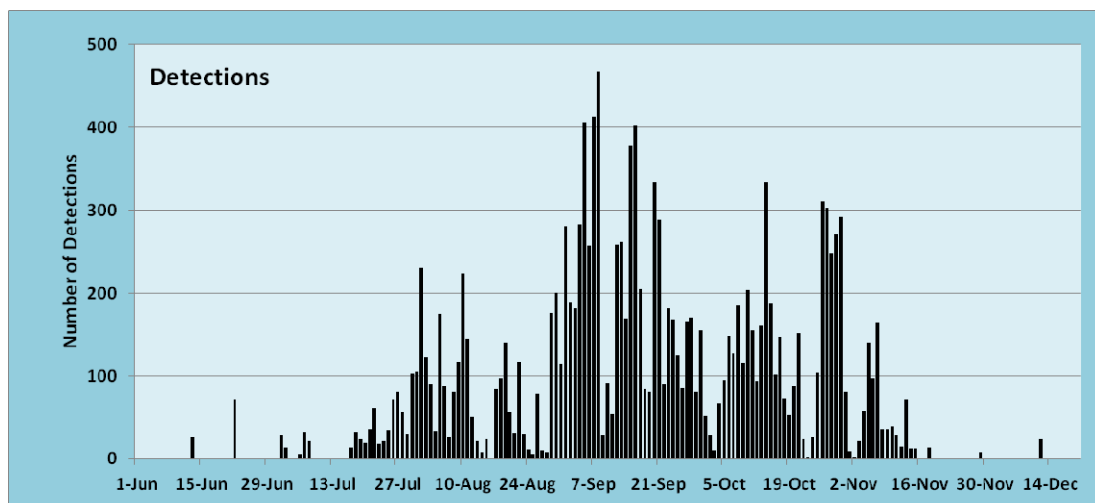


Figure 46. Daily detection frequency of 22 white sharks tagged with acoustic transmitters off the coast of Cape Cod, 2014.

Blue, Shortfin Mako, and Tiger Sharks: In cooperation with OCEARCH and the Montauk Marine Basin, one blue, two tiger, and three shortfin mako sharks were tagged with real-time SPOT tags during the second annual Shark’s Eye All-release Shark Tournament held July 12-13, 2014 in Montauk, New York. The movements of these sharks can be followed on the OCEARCH interactive tracking website.

Post-release Survivorship Studies: In 2014, work continued with University of Massachusetts researcher Diego Bernal and PhD student Heather Marshall to study the physiological effects of longline capture in sandbar and dusky sharks. Funding for the study was obtained from the Saltonstall-Kennedy Program. In 2014, Heather completed her analyses and successfully defended her dissertation. She is preparing the study for peer-review publication.

Life History: Working with NOAA Fisheries and WHOI researchers, Project personnel generated age and growth estimates for the white shark in the western North Atlantic. Using bomb-produced radiocarbon, which acts as a kind of bone marker, vertebral growth bands were counted and validated as annual. In 2014, part of this research was published (Hamady et al., 2014).

Shark Management: Program personnel participated in the development and/or amendment of state (*Marine Fisheries*), interstate (ASMFC), federal (NOAA Fisheries), and international (International Commission on the Conservation of Atlantic Tunas) shark management plans. During 2014, Project Leader Skomal served on the following committees: ASMFC Coastal Sharks Technical Committee, ASMFC Coastal Sharks Plan Development Team, ASMFC Spiny Dogfish Technical Committee, ICCAT Advisory Committee Shark Working Group, and NOAA Fisheries Highly Migratory Species Advisory Panel.

Outreach and Media: To meet the public’s demand for information on sharks, especially white sharks, numerous presentations pertaining to sharks were delivered to the public. Technical information on sharks was also provided to several media outlets. In several cases, bite marks on the carcasses of gray seals, harbor seals, and right whales were analyzed for evidence of shark predation.

As adjunct faculty to SMAST, the UMass Biology Department, Woods Hole Oceanographic Institution, and the King Abdullah University for Science and Technology, Skomal co-advised and/or served on the committees of nine graduate students; eight of which are investigating the relative abundance, life history, movements, and/or physiology of elasmobranch fishes. Three students successfully earned their degrees in 2014.

Publications

The following peer-reviewed publications were issued in 2014:

Hamady, L.L., L.J. Natanson, G.B. Skomal, and S.R. Thorrold. 2014. Vertebral bomb radiocarbon suggests extreme longevity in white sharks. Plos One, DOI: 10.1371/journal.pone.0084006.

Braun, C.D., G.B. Skomal, S.R. Thorrold, M.L. Berumen. 2014. Diving behaviors of the reef manta ray (Manta alfredi) link coral reefs with adjacent deep pelagic habitats. PLoS One, DOI: 10.1371/journal.pone.0088170.

Kneebone, J., J. Chisholm, and G.B. Skomal. 2014. Movement patterns of juvenile sand tigers (Carcharias taurus) along the east coast of the USA. Marine Biology 161:1149-1163.

Curtis, T.H., C.T. McCandless, J.K. Carlson, G.B. Skomal, N.E. Kohler, L.J. Natanson, G.H. Burgess, J. J. Hoey, and H.L. Pratt, Jr. 2014. Seasonal distribution and historic trends in abundance of white sharks, Carcharodon carcharias, in the western North Atlantic Ocean. PLoS ONE 9(6): e99240. doi:10.1371/journal.pone.0099240.

Thorrold, S.R., P. Afonso, J. Fontes, C.D. Braun, R.S. Santos, G.B. Skomal, and M.L. Berumen. 2014. Extreme diving behavior in devil rays links surface waters and the deep ocean. Nature Communications, DOI: 10.1038/ncomms5274.

Berumen, M.L., C.D. Braun, J. E.M. Cochran, G. B. Skomal, S. R. Thorrold. 2014. Movement patterns of juvenile whale sharks tagged at an aggregation site in the Red Sea. PLoS ONE 9(7): e103536. doi:10.1371/journal.pone.0103536.

Curtis, T.H., S.I. Zeeman, E.L. Summers, S.X. Cadrin, and G. B. Skomal. 2014. Eyes in the sky: linking satellite oceanography and biotelemetry to explore habitat selection by basking sharks. Animal Biotelemetry, www.animalbiotelemetry.com/content/2/1/12

Diadromous Fisheries Project

Major Restoration Projects

The following fish passage and habitat restoration projects were larger, multi-year projects of regional significance that each required two to three weeks of project time in 2014.

Draka Dam Fishway, Three Mile River, Taunton. The project to construct a fishway at the impassable Draka Dam on the Three Mile River was active in 2014, logging the most hours among all diadromous fish restoration tasks. By late-2013, all project permit applications had been submitted. Several site visits and meetings were attended with permit authorities. Approvals came in 2014 for all permits except one from the Office of Dam Safety, which required the preparation of a Final Design Report. An engineering firm was hired to prepare analyses for this report, and drafts were under review in December. The project had received an In-Lieu-of-Fee Program grant in 2013 and

received a Massachusetts Environmental Trust award in 2014 to provide enough funds for construction pending the final permit approval.

Forge Pond Dam Fish Passage Improvements, Kingston. Efforts continued on the project to restore diadromous fish to the 640-acre Silver Lake in the Jones River watershed. Assistance was given to the Jones River Watershed Association (JRWA) to prepare a successful grant application to the Massachusetts Environmental Trust on fish passage improvements at Forge Pond Dam and to execute the study. *Marine Fisheries* funded an engineering design of a fish ladder at the dam. This design was completed and presented to the dam owner, the Brockton Water Commission (BWC). Two meetings were held with each the BWC and JRWA related to the fish ladder. A Memorandum of Understanding between *Marine Fisheries* and BWC to establish the legal basis for constructing a fish ladder at Forge Pond dam was prepared and discussed with the BWC in December.

Fore River Watershed Restoration Project. Efforts continued on the multi-site project to restore diadromous fish to the Fore River Watershed in the Boston Harbor region. This project ranks high among potential diadromous fish restoration projects in the region given the opportunity to create a large river herring run to the 180-acre Great Pond Reservoir and strong local support. Two grant applications were prepared and submitted in 2014, including a proposal to the National Fish and Wildlife Foundation's Hurricane Sandy grant solicitation to fund all project components. Both were unsuccessful. A \$38,000 award was received from a 2013 application to the USFWS FONS network and matched with \$19,000 in *Marine Fisheries* funds to proceed with the design of the Armstrong Dam removal in 2015. Meetings were held with the Mayor of Braintree (July) and dam owners (July/November) to prepare specifications for the grant contract and outreach letters for the project. A major break for the project occurred when the Tri-Town Water Board received an award from MassDCR's Dam, Levee, and Coastal Infrastructure Repair and Removal Program to reconstruct the Great Pond Reservoir Dam that will include a fishway at the presently unpassable dam.

Fishway Permitting and Operation and Maintenance Plans

The general laws of Massachusetts (Chapter 130, Section 19) prescribe the authority of the Division's Director to prepare and require fishway operation and maintenance (O&M) plans. The documentation of management practices for fishways is needed for present operations and to guide future state and local staff. In 2014, eight fishway O&M plans were drafted. Of these, one was finalized (South River in Marshfield), two were new drafts (High Street Dam on Town River in Bridgewater, and Gray's Grist Mill on the West Branch of the Westport River in Westport), and five were second or working drafts (Sippican River in Rochester (2), the War Memorial Park in West Bridgewater, Long Pond on the Parker River in Yarmouth, and Morey's Street Dam on the Mill River in Taunton).

Marine Fisheries issues Fishway Construction Permits following the review of final fishway plans and coordination with Town Conservation Commissions and the U.S. Army Corps of Engineers. Three *Marine Fisheries* Fishway Construction Permits were drafted and finalized in 2014.

Completed Fish Passage and Restoration Projects

Tom Matthews Pond, Yarmouth. A 24-foot wood weir and pool fish ladder was installed at Tom Matthews Pond in Yarmouth in March 2014. The fish ladder replaced a degraded wood Denil fish ladder. The fish ladder was funded by the Bass River Rod and Gun Club and designed and constructed by our Fishway Crew with the assistance of DQ Engineering.

Mill Pond, West Tisbury. A 35-foot wood weir and pool fish ladder was installed at the Mill Pond Dam in West Tisbury in May 2014. The fish ladder replaced a degraded weir and pool fish ladder. The fish ladder was designed and constructed by our Fishway Crew with assistance from USFWS Fish Passage engineers.

Monument River, Bourne.

A concrete diversion weir was constructed at Carter Beal Park on the Monument River in Bourne during September 2014 (Figure 47). A failed weir had, for decades, allowed river herring to be falsely attracted to a mill raceway where no upstream passage was allowed. The mill raceway was also the cause of periodic juvenile herring mortality. The Town of Bourne funded project materials and our Fishway Crew constructed a new diversion weir, and board slots and a plunge pool at the mill dam to better manage stream flows and avoid fish mortality.

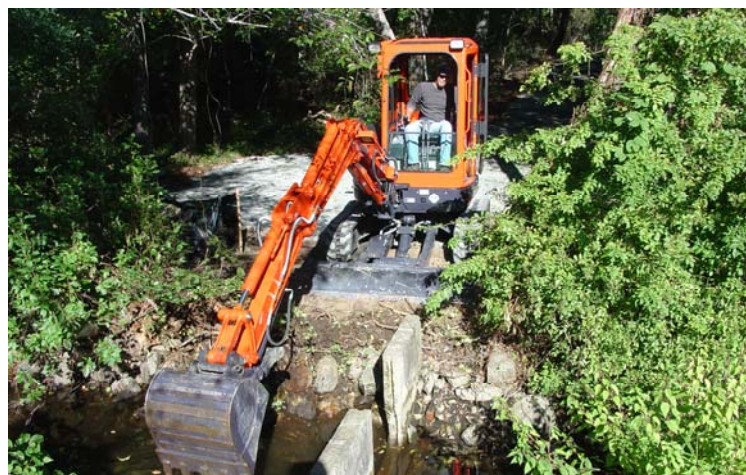


Figure 47. A failed weir that was impeding the upstream passage of river herring on the Monument River in Bourne was replaced during 2014.

Gorman Mill Pond, Pembroke. A 23-foot wood Denil fish ladder was installed to replace a non-functional fish ladder at Gorman Mill Pond on Herring Brook in Pembroke. Our Fishway Crew worked with the Pembroke Herring Commission to remove the old ladder that was impeding juvenile herring emigration during the fall of 2013 and to reconstruct and install the fish ladder during March 2014.

Eel Ramp Installations. New eel passageways were installed at Silver Spring at Mass Audubon's wildlife sanctuary in Wellfleet and Morey's Bridge Dam on the Mill River in Taunton in 2014. Both are custom pump-supply eel ramps fabricated by our Fishway Crew. The Mill Brook eel ramp in Rockport, built in 2012, was outfitted this year with a gravity-supply, floating collection tank designed by our Fishway Crew. The eel ramp at Morey's Bridge Dam was funded by the project partners *MassDOT* and *MassDCR*, and the other two installations were funded by *Marine Fisheries*.

River Herring Run Channel Clearing. *Marine Fisheries'* Fishway Crew routinely fields requests to assist towns to maintain passageways for river herring. The work can involve developing plans for removing debris jams and fallen trees that block passage or responding quickly during migration season to remove blockages that threaten sea-run fish survival. In 2014, ongoing efforts took place at Furnace Brook to connect the main stem Taunton River to Lake Rico in Taunton and at Herring Brook in Pembroke to remove wood debris downstream of Third Mill Pond in cooperation with the Pembroke Herring Commission. A single day was also spent working to clear the run between Seymour and Hinckleys ponds in Harwich.

Mystic Lakes Dam, Medford. Work continued with *MassDCR* to improve river herring downstream migration and improve upstream passage for river herring and eel at the Mystic Lakes Dam in Medford. The dam was reconstructed in 2011 with a new Denil fish ladder. River herring mortality, both juveniles and adults, has been observed at the spillway during downstream movements. Efforts

have focused on the O&M plan and the function of the spillway bays and low flow channel. In 2014, *Marine Fisheries* staff assisted with the deployment of over 150 sandbags on the crest of the spillway bays and along the low flow channel to contain flows and emigrating river herring. This short-term fix was successful in reducing river herring mortality and led to continued discussions on long-term structural fixes and O&M plan improvements.

New/Ongoing Fish Passage and Restoration Projects

Cape Cod Water Resources Restoration Project. The USDA Natural Resources Conservation Service received federal funding in 2010 for the Cape Cod Water Resources Restoration Project, with one component targeting the reconstruction of anadromous fishways on Cape Cod. The Cedar Lake and Santuit Pond fishways were constructed in the summer of 2013. The Santuit Pond fishway required numerous site visits in 2014 to troubleshoot a problem with weir turbulence. Consultations with USFWS engineering staff and trial-and-error testing of weir modifications by our Fishway Crew led to passage improvements.

Town River, West and East Bridgewater. An effort was initiated in 2013 to work with the Towns of East and West Bridgewater to prepare O&M plans for the Town River fish ladders at War Memorial Park and the High Street Dam. Both sites need fishway improvements; however, basic guidelines for fishway operations and flow targets are lacking. Several site visits were attended with representatives of the property owners. Two pond level staff gauges were provided and installed at Town River upstream of War Memorial Park. A second draft of the O&M plan for War Memorial Park fish ladder was reviewed and accepted as a working draft and a first draft of an O&M for the High Street Dam was sent to the dam owner for review.

Back River Fishway Barrier Wall, Weymouth. *Marine Fisheries* received a state budget earmark of \$50,000 to replace or redesign the flood control tunnel gate at the Back River Jackson Square fishway that has caused several large fish kills in recent years. A contract was prepared in 2013 to send the funds to the Town of Weymouth. An engineering contractor was hired in 2014 to conduct the project design and permitting. Several drafts of a preferred option were reviewed late in 2014.

Talbot Mills Feasibility Study. A feasibility study on improving fish passage at the Talbot Mills Dam on the Concord River was initiated in 2013. The dam is not passable for diadromous fish. An engineering contractor was hired in 2014 to conduct the study, and the project kick-off meeting was held in Gloucester during March.

Westport River, Westport. After two years of conceptual assessments, a large-scale restoration effort in the Westport River began in 2014. River herring are impeded from reaching the 165-acre Lake Noquochoke at two impassable dams. Discussions were held with the owners of both dams in 2014 to discuss future property plans and the feasibility of creating fish passage. A contract was made with the USFWS to fund a conceptual design for a fish ladder at the first dam, Forge Pond Dam.

Seymour Pond, Harwich. The Fishway Crew began work in September to replace an 8-foot wood weir and pool fishway flume at Seymour Pond in Harwich. The old structure has degraded and is severely laden with sand. The replacement flume was fabricated and the old structure was partially dug out in October. Rising pond levels caused the project conclusion to be delayed until 2015.

Pilgrim Lake, Orleans. *Marine Fisheries'* Fishway Crew began work in September to replace 75 feet of a degraded concrete weir and pool fish ladder connecting Pilgrim Lake to tidal waters in Orleans (Figure 48). The town funded the fish ladder materials. A new concrete form exit chamber was

constructed along with approximately 60 feet of the weir and pool ladder. The Crew will need to return in 2015 to finish this job.



Figure 48. *MarineFisheries'* Edward Clark works on repairs to a degraded concrete weir and pool fish ladder in Orleans between Pilgrim Lake and tidal waters.

Technical Assistance

MarineFisheries provides routine technical assistance to local authorities, private organizations, and other agencies on topics related to diadromous fish resources. Effort spent on such technical assistance can amount to relatively few hours for individual inquiries or requests, or dedicated efforts related to specific tasks such as river herring habitat assessments.

River Herring Habitat Assessment. River herring habitat assessments are conducted to assess the suitability of habitats for restoration potential and to contribute to habitat and water quality remediation efforts. In 2014, assessments were conducted during May-September at: Snipatuit Pond and Tinkhams Pond in the Mattapoissett River watershed, Rochester; Chebacco Lake, Essex; Red Lily Pond, and Lake Elizabeth, Barnstable; and Great and Little Herring Ponds, Bourne. The assessments at Chebacco Lake, Snipatuit Pond, Tinkhams Pond, Red Lily Pond, and Lake Elizabeth were completed in 2014.

After the field season, effort focused on data processing and assessment writing. A draft assessment report for the Fore River watershed assessment of 2008/2010 was prepared and submitted for review in the *MarineFisheries* Technical Report series in 2014. The data transcription and processing effort for the Whitman's Pond assessment report in Weymouth began in 2014.

River Herring Sustainable Fisheries Plans. The 2009 amendment to the interstate management plan for river herring requires the development and approval of sustainable fisheries plans to allow any harvest of river herring. Massachusetts river herring runs have all been closed to harvest since 2006. Two inquiries were received in 2014 on the process for opening the Agawam River (Town of

Wareham) and Nemasket River (Middleborough-Lakeville Herring Commission). Meetings were held with both parties and response letters prepared. The Wareham response determined that the Agawam River run was not in a suitable condition to warrant harvesting at this time. Staff began work with the Middleborough-Lakeville Herring Commission to develop a Sustainable Fishery Plan for the Nemasket River. Two subsequent meetings with the Commission were attended to further develop the plan scope.

Diadromous Fish Restoration Priority List/MassDOT Diadromous Fish GIS Datalayer. Project staff maintains a diadromous fishway status and restoration project priority list. The list was last updated in 2011 and contains about 450 fishways, impediments, and potential restoration sites in the four major coastal regions of Massachusetts: Buzzards Bay, Cape Cod, South Shore, and North Shore/Boston Harbor. The sites were ranked by restoration potential within each region. The list focuses on passageways for river herring but considers others species of diadromous fish and watershed connectivity.

Marine Fisheries teamed up with MassDOT to link the fish passage survey and priority list to a GIS datalayer that supports MassDOT transportation infrastructure planning. MassDOT funded a cooperative project to create the diadromous fish GIS datalayer and hired AECOM to work with *Marine Fisheries* to merge datalayers on transportation infrastructure, diadromous fish habitat, and *Marine Fisheries* species Time-of-Year (TOY) data. A large effort occurred in 2014 to complete the GIS datalayer. A second round of groundtruthing and troubleshooting all site entries was completed. Three meetings were held with the project team followed by a training session to introduce the first version of the datalayer.

River Herring Network. Staff provided assistance to a coalition led by the Cape Cod Commercial Fishermen's Alliance who received a grant to develop a river herring warden network. John Sheppard served on their steering committee. At the Network's annual meeting in Plymouth during October, Brad Chase gave a presentation on the status of river herring in Massachusetts, and Brad and John participated on a panel discussion of stream maintenance for herring runs.

Biological Assessments for River Herring

Dedicated monitoring is annually conducted for river herring, which includes the closely related alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), historically the most abundant and valuable diadromous fish in Massachusetts. In 2014, monitoring continued with adult river herring counts and biological sample collections from Monument River, Bourne; Town Brook, Plymouth; Mystic River, Medford; Agawam River, Wareham; Wankinco River, Wareham; Mattapoissett River, Mattapoissett; Nemasket River, Middleboro; Herring River, Harwich; Merrimack River, Lawrence; Parker River, Newbury; Acushnet River, Acushnet; and Charles River, Boston. A total of 2,798 alewives and 1,544 blueback herring (plus 302 American shad) were sampled from nine of these coastal systems during the year.

Marine Fisheries data collections indicate that river herring populations are experiencing a truncation in age structure, with fewer older fish being collected and fish apparently smaller at age than in past years. In particular, the age structure of alewives appears to have shifted to younger fish (modal age-3) in Town Brook, the Nemasket and Mystic rivers. Counts varied from approximately 7,189 fish in the Parker River to 590,105 in the Nemasket River. Electronic monitoring in 2014 indicated that some rivers experienced increases in the number of fish returning to their natal spawning grounds. Adult returns increased in the Monument River in 2014 (278,134 fish) compared to 2013 (252,871 fish). Counts increased from 2013 to 2014 in the Acushnet River (from 6,033 fish to 10,144 fish), the

Mattapoisett River (from 21,613 fish to 55,429 fish), the Agawam River (from 33,637 fish to 48,873 fish), and the Wankinco River (from 8,734 fish to 18,625 fish).

Marine Fisheries also provides technical assistance to local groups conducting volunteer, visual counts of herring runs. In 2014, a total of 35 rivers were monitored in Massachusetts. Monitoring occurred in 28 towns representing eight major drainage areas.

Passage of diadromous species is monitored during the spring/summer each year at the first obstruction on the Merrimack River (Essex Dam in Lawrence). Passage of American shad on the Merrimack River for 2014 (34,789 fish) decreased compared to 2013 (37,711 fish). In addition, 128 striped bass, 4,923 sea lamprey, and 33,517 river herring (a substantial increase from 17,359 river herring in 2013) were also lifted above the dam in 2014.

Propagation

Efforts to re-establish, augment, and enhance natal anadromous runs in conjunction with ongoing fishway improvement projects resulted in a total of 2,809 pre-spawning adult river herring trapped and transported via stocking truck or lifted above a barrier into four coastal systems throughout the Commonwealth (Table 17). The four systems that received gravid fish in 2014 were: Robbins Pond (Satucket River, East Bridgewater); Santuit Pond (Santuit River, Mashpee); Standish Mill Pond (Town Brook, Plymouth) and Pentucket Pond (Parker River, Georgetown). An additional 2,000 alewives were trapped from a Massachusetts donor system (Nemasket River, Middleborough) and released into two Rhode Island coastal systems (Ten Mile River, Turner Reservoir, East Providence; and Kickemuit Reservoir, Warren) in a cooperative effort to sustain their small populations.

Table 17. Number of pre-spawning adult river herring trapped and transported via stocking truck or lifted above a barrier in 2014.

Donor System	Recipient System	Number of Adults
Nemasket River	Satucket River*	602
Nemasket River	Ten Mile River**	1,000
Nemasket River	Kickemuit Reservoir**	1,000
Parker River	Pentucket Pond	176
Parker River	Main Street (Parker River)	531
Town Brook	Standish Mill Pond	1,000
Santuit River	Santuit Pond	500

* Denotes out-of-basin transfer (between river systems)

** Denotes out-of-basin transfer (between states)

In 2014, *Marine Fisheries*, in conjunction with the USFWS-Central New England Fisheries Resource Office, continued efforts to restore American shad to the Charles River watershed. Approximately 2.98 million young-of-year shad hatched from Merrimack River broodstock at the USFWS North Attleboro National Fish Hatchery were released above the Moody Street dam. A double oxytetracycline mark was used on hatchery larvae to validate ageing methods and examine year-class specific mortality of shad in the Charles River. In contrast to the recent past, young-of-year as well as adult shad were observed. While *Marine Fisheries* made periodic inspections of the downstream fishways during the spring, these observations are convincing evidence that passage to spawning areas was available.

Rainbow Smelt Population and Habitat Monitoring

Rainbow smelt are a popular sport fish in Massachusetts and important forage for many species of fish and wildlife. Smelt population declines since the 1980s prompted *Marine Fisheries* to initiate spawning run monitoring in 2004. In-stream fyke nets are used to provide a relative index of population abundance and age-structure data. A five-year grant from the NOAA Office of Protected Species (Species of Concern Project) supported the fyke net project for 2008-2012, including a full-time technician position. Following the conclusion of the grant in 2012, field monitoring in 2013 was reduced from nine to six stations given the staff reduction. In 2014, the project committed to long-term monitoring at four fyke net stations. Smelt were caught at each station in 2014. To date, over 35 species of fish have been caught in the fyke nets, including 10 diadromous species.

Following the spring field season, project efforts shifted to field data entry, processing and analysis. At year's end, manuscripts were under development on smelt population demographics and spawning habitat characteristics in the study area of Maine, New Hampshire, and Massachusetts.

American Eel Young-of-the-Year Monitoring

All East Coast states conduct standardized monitoring of YOY American eels under mandatory ASMFC protocols. *Marine Fisheries* has monitored the spring migration of YOY eels in the Jones River since 2001 to contribute to a coastwide index of eel population relative abundance, and continued to do so in 2014. YOY monitoring stations were also maintained in the Acushnet and Parker Rivers in 2014. Work continued to organize and improve the trap data files for inclusion in the next coastwide eel stock assessment.

In addition to the ASMFC-required YOY traps monitoring, this project also monitors eel ramps installed in coastal rivers. *Marine Fisheries* first installed an eel ramp in the Saugus River in 2007 and has cooperatively installed one ramp annually in most years since. Most ramps are outfitted with a collection tank to evaluate the performance of the eel ramp and the potential to use the location as a monitoring station for census counts of YOY or age-1+ eels. The following locations have eel ramps with cooperative monitoring efforts: Saugus River, Saugus (2007); Cold Brook, Harwich (2008); Wankinco River, Wareham (2008); Pilgrim Lake, Orleans (2009); and Mystic Lakes Dam, Medford (2010, [Figure 49](#)), and Mill Brook, Rockport (2012). New eel ramps were designed in 2014 by *Marine Fisheries*' Fishway Crew and installed at Morey's Street Dam on the Mill River, Taunton and Silver Springs Pond, Wellfleet. Letters of authorization were drafted for each site to allow local groups to collect and transport juvenile eels upstream.



Figure 49. American eel in the collection tank on the Mystic Lakes dam eel ramp.

Other Activities

ASMFC Participation: Staff actively participated in ASMFC Technical Committees and with diadromous fish stock assessments. Compliance reports were drafted in 2014 for sturgeon (Dr. Mike Bednarski), American eel (Brad Chase), and river herring/American shad (Brad Chase and John

Sheppard). Mike Bednarski served on the Atlantic Sturgeon Technical Committee. Brad Chase served on the River Herring and American Shad, American Eel, and Fish Passage Technical Committees and served on the American Eel Plan Development Team.

Publications, Reports, and Presentations:

Sheppard, J. J., Block, S., Becker, H. L., and Quinn, D. 2014. The Acushnet River Restoration Project: Restoring Diadromous Populations to a Superfund Site in Southeastern Massachusetts. Mass. Div. Marine Fisheries Tech. Rep. No. 56. 97p.

Sheppard, J.J., and Bednarski, M.S. 2014. Corrective measures to improve the accuracy of electronic fish counting systems in estimating run size of large anadromous river herring populations. 144th Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada. 8/17/14 – 8/21/14.

Tommasi, D.T., Nye, J., Stock, C., and Sheppard, J.J. 2014. Changes in River Herring Spawning and Juvenile Emigration Phenology in Response to Environmental Conditions. 144th Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada. 8/17/14 – 8/21/14.

*Nelson, G.A., Sheppard, J.J., and Armstrong, M.P. 2014. An exploratory analysis of biotic and abiotic factors affecting mortality and recruitment of Monument River alewife (*Alosa pseudoharengus*). 144th Annual Meeting of the American Fisheries Society, Quebec City, Quebec, Canada. 8/17/14 – 8/21/14.*

Sheppard, J. J., Block, S., Becker, H. L., and Quinn, D. 2014. The Acushnet River Restoration Project: Restoring Diadromous Populations to a Superfund Site in Southeastern Massachusetts. International Conference on Engineering & Ecohydrology for Fish Passage. Univ. Wisconsin, Madison, WI, 6/9/14 – 6/11/14.

ADMINISTRATION

Personnel

Kevin Creighton, Chief Fiscal Officer

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Eva Morales, Accountant III

Jeanne Hayes, Accounts Receivable Coordinator

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Kerry Allard, Permitting Leader

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Ralph Stevens, Shellfish Purification Plant, Facilities

Overview

Marine Fisheries Administrative Program is responsible for the Division's fiscal functions, permitting, grants management, capital assets, and most recently outreach efforts. The Program develops, analyzes, and manages the Division's financial planning and resource allocation activities including budget submissions to the Legislature. Analysts provide financial and performance analysis of Division programs, operations, and policies. Analysts are responsible for the following: monitoring and forecasting revenue and expenditures; preparing the Division's annual budget recommendation and spending plans; working with Department, Legislative and Executive Branch budget staff; identifying and monitoring key budget and policy issues; and analyzing and proposing policy and savings initiatives. The Program is responsible for permit issuance, collecting fees, and reconciling

revenue. The Program also provides all fiscal oversight and reporting on grants, contracts and mitigation projects. In addition, all capital assets are procured, inventoried, managed, and maintained through the Bureau. Outreach is conducted through the creation of media to be distributed to the general public through face-to-face interactions and the *MarineFisheries* website. Facilities Management is conducted with the intent to provide a healthy and productive working environment. This is accomplished by supplying staff agency-wide with the tools needed to meet their project's goals and objectives. This includes a safe working environment and equipment, vehicles, and vessels maintained and repaired on a timely basis as necessary.

Budget

State-Appropriated Funds

After a six-year period of budget reductions, the *MarineFisheries* operating budget saw a slight increase in FY2013. The upward trend continued in FY2014 with a second year of growth at just over 1%. This increase is reflective of the overall budget of the Commonwealth, which has seen revenue growth in each of the past five fiscal years. The FY2013 and FY2014 state appropriations are shown in Table 18.

Table 18. Initial Fiscal Year 2013 and 2014 Appropriations

Title	Acct. Number	FY2013	FY2014	Change
General Operating ^{1,2}	2330-0100	\$4,682,837	\$4,734,039	+1.09%
Sport Fish Program ²	2330-0120	\$591,800	\$591,800	0%
Sport Fish Retained Revenue	2330-0121	\$217,989	\$217,989	0%
Depuration Retained Revenue ³	2330-0150	\$47,578	\$57,016	+19.84%
Total		\$5,540,113	\$5,600,753	+1.09%
Saltwater Sport Fish Licensing ⁴	2330-0300	\$767,191	\$1,042,470	+35.88%

¹Following the recession of 2008, tight constraints were put in place on all general fund accounts. This included the elimination of earmarks, which remained in place through the FY2012 budget. Beginning in FY2013, *MarineFisheries* main operating account included earmark language that was further expanded in FY2014. Because this funding is not available for *MarineFisheries* operations, it is not included in Table 18 as part of the FY2013 or FY2014 general operating appropriation. The final budget for FY2013, Chapter 139 of the Acts of 2012, included an earmark in the amount of \$200,000 to the School of Marine Science and Technology. The final budget was reduced mid-way through the fiscal year by Governor Deval Patrick through the 9c budget reduction process, and the earmark was lowered to \$100,000. The final budget for FY2014, Chapter 38 of the Acts of 2013, included the following earmarks: \$425,000 and \$75,000 to the School of Marine Science and Technology, \$200,000 for the Gloucester Marine Genome Initiative, \$50,000 for the protection of the Herring Run in the town of Weymouth, and \$75,000 for shellfish propagation in Barnstable, Dukes and Nantucket counties.

²Supplemental Budget: In addition to Chapter 38 of the Acts of 2013, a supplemental budget was passed for FY2014 that included \$130,000 for *vibrio* monitoring and \$100,000 for data collection to enhance the black sea bass assessment.

³In the FY2012 budget, the Legislature created a new retained revenue appropriation. The account was established so that fees collected from the depuration of shellfish could be used for the operation and maintenance of the Newburyport shellfish purification plant. Shellfish depuration revenues have been on a steady decline for the past decade. In an effort to increase the potential use of the shellfish purification plant, *MarineFisheries* received authorization to offer wet storage services to dealers for shellfish that had been harvested from unrestricted (open) areas. The wet storage activity allows shellfish to naturally eliminate sand, thus allowing dealers the option of providing a more desirable product (de-sanded shellfish) to consumers. The additional service offered at the facility resulted in an overall increase of product going through the plant and an increase in plant revenue in FY2014. Although there is no general fund revenue in this account,

expenditures in this appropriation can be used to offset budget reductions in the general operating account; as such, the total amount collected has been included in the “Total” amount listed in Table 9.

⁴In 2011, *Marine Fisheries* instituted a new program to issue recreational saltwater fishing permits as required by the “Saltwater Act” of 2009. The law mandates that all revenue collected under this program be directed to the Marine Recreational Fisheries Development Fund. Available funds may then be appropriated as part of the normal budget process for authorized expenses in the following fiscal year. FY2011 was the first year of this program, and it is expected that the program will continue to grow over the first five years as fishermen become aware of the permit requirement. Because funds from this appropriation cannot be used to offset costs in other appropriations, the appropriated amount is not included in the “Total” amount listed in Table 18 so that an accurate comparison between fiscal years on operating costs can be made.

Overall, *Marine Fisheries* realized a marginal increase of approximately 1.1% in appropriated funds for the operating budget in FY2014. The bump up was insufficient to meet the increase to annualized costs for payroll and utilities, which was approximately 2.9% over the same time period. To address the operating budget shortfall and maintain a high level of service, *Marine Fisheries* worked with the legislature and was successful in getting a supplemental budget that included \$130,000 in funds for the main operating account. *Marine Fisheries* also continued to utilize “soft money” through grant opportunities and shifted costs where appropriate. In addition, two vacant full-time positions remained unfilled, and a half-time position was eliminated.

The breakdown of overall costs by primary spending category for the *Marine Fisheries* operating accounts can be seen in Table 19 and Figure 50.

Table 19. Fiscal Year 2014 Costs, State Appropriations (rounded to whole dollars)

Account Number	2330-0100	2330-0120	2330-0121	2330-0150	Line Total
Salaries	\$4,141,715	\$583,505	\$35,954	\$39,991	\$4,801,165
Employee Expenses	\$6,855		\$6,471		\$13,326
Contracted Employees			\$4,289		\$4,289
Contracts	\$4,297		\$60,352		\$64,649
Equipment					\$0
Facility Maintenance	\$26,234		\$17,688	\$3,269	\$47,191
Field & Lab Supplies	\$95,213		\$22,881	\$7,011	\$125,105
Fringe Costs	\$58,812	\$8,286	\$571	\$568	\$68,237
Fuel	\$75,795		\$273		\$76,068
Utilities	\$117,518				\$117,518
Lease/Rent	\$94,440				\$94,440
Maintenance/Repair	\$48,095		\$6,808		\$54,903
Office & Administrative	\$151,114		\$35,574		\$186,689
Services/Equipment Lease	\$18,568		\$14,170	\$1,995	\$34,733
Information/Technology			\$3,860		\$3,860
Government Contracts	\$21,500				\$21,500
Outside Agencies	\$92,358			\$7,217	\$99,575

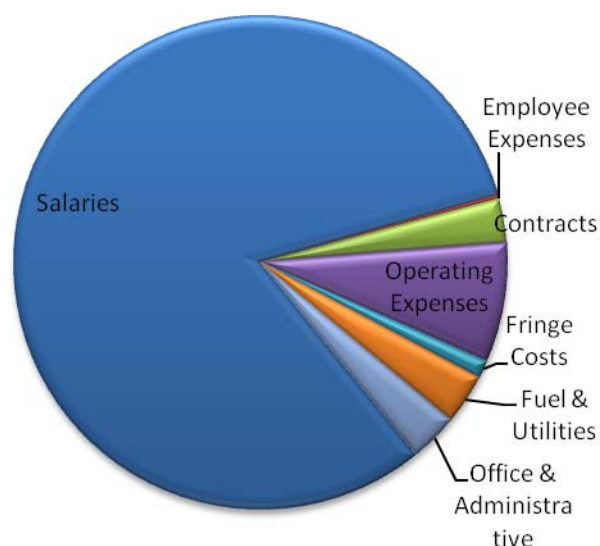


Figure 50. FY2014 Spending Category Summary

Staffing

Authorized personnel levels for calendar year 2014 are shown in [Table 20](#).

Table 20. Fiscal Year 2013 and 2014 Authorized Personnel Levels

Title	Acct. Number	FY2013	FY2014
<i>Marine Fisheries</i> General Operating	2330-0100	65	61
Sport Fish Program	2330-0120	10	10
Saltwater Sport Fish Licensing	2330-0300	7	7
Federal Grants and Trust Account	2330-xxxx*	22	20
Total Employees in All Appropriations		104	98

*Multiple account numbers

Total staffing levels were down slightly over the course of FY2014 when compared to FY2013. One new position was added, three were eliminated, and several were vacant at the end of the fiscal year with plans to backfill early in the next fiscal year. The new position added was assigned to the eel grass restoration project out of the Gloucester office. Positions that were eliminated included two laborers, and a part-time fisheries management specialist. Vacancies on the Clean Vessel Act Program and the Shellfish Program are scheduled to be filled in FY2015.

Revenue

Marine Fisheries collects fees primarily from permit issuance and from processing racks of soft-shelled clams at the Shellfish Purification Plant in Newburyport. A total of 29,209 permits and endorsements were issued by the Licensing Program for the categories of commercial fishing, seafood dealers, and special permit types, producing General Fund revenue of \$1,974,835 in 2014. This represents a slight decrease in revenue (~2%) from permit issuance in 2013.

Revenue from the depuration of soft-shelled clams at the Shellfish Purification Plant in Newburyport has shown a steady decline over the past decade. To increase the plant productivity, the Massachusetts legislature approved an expansion of services in the 2012 budget to include de-sanding of shellfish. De-sanding operations begin in March of 2013, and the plant realized a slight increase in processed racks of soft-shelled clams in 2013 (depuration and de-sanding combined) as compared to 2012. This was the first increase in volume from one year to the next in more than 10 years. De-sanding accounted for more than 60% of the plant production. As had been the trend prior to 2013, volume dropped off dramatically in 2014 with the plant processing only 6,974 racks resulting in General Fund revenues of \$41,842. This was a drop of over 30% as compared to the 2013 value of \$62,256.

In addition to General Fund revenue, *Marine Fisheries* generated \$1,274,298 in revenue for the Marine Recreational Fisheries Development Fund from the issuance of 163,971 recreational salt water fishing permits in 2014. This completed the fifth year of the recreational fishing permit program. Since its inception, the total number of permits issued has increased each year, with growth over the past two years at about 2 to 3% per year.

Commercial Fisherman Permits

Anyone who lands and sells finfish, shellfish, lobsters, edible crabs, or other living marine resources in Massachusetts must have a *Marine Fisheries* commercial fishing permit and must sell only to licensed Massachusetts dealers. All commercial permits, except Rod & Reel and Seasonal Lobster, may be endorsed for shellfish at no additional cost. See [Table 21](#) for the number of commercial fisherman permits issued, by type, in 2014 and resulting revenue. In 2014, *Marine Fisheries* added a business name field to the transaction card/permit on permits endorsed for shellfish, and also instituted a “point-of sale” striped bass tagging program.

Table 21. 2014 Commercial Licensing and Revenue Statistics

Permit Type (and resident/non-resident fee)	Permits Issued (#)		Revenue
	Resident	Non-Resident	
Coastal Lobster (\$260/\$520)	1,161	4	\$303,940
Offshore Lobster (\$260/\$520)	318	86	\$127,400
Seasonal Lobster (\$65/\$130)	74	2	\$5,070
Boat 99'+ (\$260/\$520)	13	17	\$12,220
Boat 60-99' (\$195/\$390)	77	134	\$67,275
Boat 0-59' (\$130/\$260)	3,052	318	\$479,440
Individual (\$65/\$130)	252	9	\$17,550
Shellfish (\$40/\$80)	804	16	\$33,440
Shellfish & Rod & Reel (\$55/\$130)	458		\$25,190
Rod & Reel (\$35/\$100)	495	43	\$21,625

Coastal Lobster Permit allows the taking, landing, and sale of lobsters and edible crabs (to a licensed dealer) harvested from within the coastal waters of the Commonwealth. There is a maximum pot limit per vessel that is based on Lobster Management Areas and individual allocations. The permit may be endorsed to take and sell shellfish and finfish at no additional cost. In the case of skin or scuba divers, only the licensee is covered.

Offshore Lobster Permit allows the landing and sale of lobsters and edible crabs (to a licensed dealer) taken outside of the coastal waters of the Commonwealth pursuant to appropriate federal permit(s). If the permit is endorsed for the use of pots to harvest lobster, there is a maximum pot limit per vessel that is based on Lobster Management Areas and individual allocations. The permit may be endorsed to take and sell shellfish and finfish at no additional cost.

Seasonal Lobster Permit is issued to full-time students only (verification required), and allows the licensee only to take and sell lobsters and edible crabs (to a licensed dealer) from June 15–September 15. A maximum of 25 pots may be used. Diving is not permitted; sale of fish and/or shellfish is not permitted.

Boat Permit allows the taking, landing, and sale of finfish (to a licensed dealer) and may be endorsed for shellfish. The permit covers everyone aboard the vessel. Price varies with vessel size. No lobsters or edible crabs may be taken.

Individual Permit allows the holder only to take, land, and sell finfish (to a licensed dealer) and may be endorsed for shellfish. No lobster or edible crabs may be taken.

Shellfish Permit* allows an individual to take, land, and sell (to a licensed dealer) shellfish and seaworms. A shellfish ID card from *Marine Fisheries* and a town permit are also required.

Rod & Reel Permit allows the holder only, to catch and sell finfish (to a licensed dealer) caught by Rod & Reel only. No other gear types may be used.

Shellfish Transaction Card: *Marine Fisheries* added the capability in 2014 to print a business name, in addition to an individual's first and last name, on commercial permits and shellfish transaction cards. This was done for two reasons. The first was to allow for better linking between federal and state permits. Because state permits are generally issued to individuals and federal permits are often issued in business names, *Marine Fisheries* staff have had difficulty linking the two permit types. After the business name field was added, staff spent a considerable amount of time linking state and federal permits by vessel and, where appropriate, adding a business name to the state permit. Second, the business name and individual's name on a permit can now be printed on the corresponding shellfish transaction card for shellfish businesses. This allows for better tracking of shellfish coming from aquaculture grants and shellfish dredge boats.

Employee Shellfish Transaction Card: For several years, shellfish aquaculture businesses have been asking for the ability to have shellfish transaction cards that cover all employees that work for a business. Because the shellfish transaction card must be issued to a named individual and used in conjunction with a driver's license, this has not been possible in the past. The addition of the business name, as well as the first and last name, to permits and shellfish transaction cards allowed *Marine Fisheries* to develop a solution to accommodate this request in the form of a pilot program for 2014. Now the business name can be used as the common permitting and reporting link between shellfish businesses and their employees, allowing transaction cards to be printed with both the business name and employee name. In 2014, 37 shellfish businesses received employee shellfish transaction cards for a total of 58 employees. These cards were issued at no cost.

Dealer Permits

Anyone engaged in the wholesale or retail trade of raw fish, shellfish, lobsters, or bait, whether frozen or unfrozen, must have a *Marine Fisheries* Dealer Permit and may be subject to inspection from the Massachusetts Department of Public Health (*MassDPH*). Shellfish dealers must abide by

MassDPH regulations for tagging and record keeping. Massachusetts seafood dealers who purchase seafood products, even if for bait purposes, directly from fishermen are considered primary buyers, and must be so endorsed on their dealer permits. See Table 22 for the number of dealer permits issued, by type, in 2014 and resulting revenue.

Table 22. 2014 Dealer Licensing and Revenue Statistics

Permit Type (and resident/non-resident fee)	Permits Issued (#)		Revenue
	Resident	Non-Resident	
Wholesale Dealer (\$130/\$260)	393	7	\$52,910
Wholesale Truck (\$130/\$260)	97	141	\$49,270
Wholesale Broker (\$130/\$260)	32	5	\$5,460
Retail Dealer (\$65/\$130)	747	56	\$55,835
Retail Truck(\$65/\$130)	37	4	\$2,925
Retail Boat (\$65/\$130)	102		\$6,630
Bait Dealer (\$65/\$130)	145	11	\$10,855

Wholesale Seafood Dealer Permit allows the holder to acquire, handle, store, distribute, process, fillet, ship, or sell raw fish and/or shellfish, whether frozen or unfrozen, in bulk or for resale. It also allows retail sales from the same single, fixed location. An approved inspection from the Division of Food and Drugs is required. A copy of the inspection report must be submitted with the application to *Marine Fisheries*. The name and address must be the same on the inspection report and permit. This permit may be endorsed for bait (excluding shellfish), with an inspection specifically stating, “Approved for retail and bait license”. A Hazard Analysis and Critical Control Points (HACCP) plan is required.

Wholesale Seafood Truck Dealer Permit allows the holder to acquire, handle, distribute, ship, or sell raw fish, whether frozen or unfrozen, in bulk or for resale from a truck only. It does not allow the holder to process raw fish, whether frozen or unfrozen, lobster, or shellfish. Nor does it allow the holder to purchase shellfish or shuck, re-label, or repack shellfish. An approved inspection from the Division of Food and Drugs is required. A copy of the inspection report must be submitted with the application to *Marine Fisheries*.

Wholesale Seafood Broker Permit allows the holder to act as an agent who negotiates contracts of purchase and sale of seafood. The brokerage activities will not involve the actual handling, processing or reshipping of finfish, shellfish or other marine resources. A “broker only” waiver must be filed in lieu of a health inspection.

Retail Seafood Dealer Permit allows the holder to sell raw fish, whether frozen or unfrozen, shellfish, and lobsters at one retail location. The holder must purchase shellfish only from a holder of a wholesale dealer or wholesale truck permit, or from a certified out-of state wholesale dealer. Shellfish CANNOT be purchased directly from a harvester. It does not allow the holder to shuck, relabel, or repack shellfish. An approved inspection from the Division of Food and Drugs must be submitted to *Marine Fisheries*. The name and address must be the same on the inspection report and permit. This permit may be endorsed for bait (excluding shellfish). The inspection must specifically state “Approved for retail and bait license”.

Retail Seafood Truck Dealer Permit allows the holder to sell fish or lobsters at retail from a mobile unit (does not include shellfish). It does not allow the holder to process, fillet, shuck, cook, etc. An inspection is required from a town or county Board of Health. A copy of the inspection must be

submitted with the application. The name and address must be the same on the inspection report and permit. A Hawkers and Peddlers permit may also be required.

Retail Boat Seafood Dealer Permit allows the holder to sell “whole” fish and lobsters from his/her boat only (does not include shellfish). A commercial fisherman’s permit is required in addition to this permit. A boat waiver must be filed in lieu of a health inspection.

Bait Dealer Permit allows the holder to take and sell marine bait. No inspection is required. Local regulations (i.e., on worms, eels, etc.) may apply.

Special Permits

Special permits are required for scientific collection, shellfish aquaculture, shellfish propagation, contaminated shellfish harvest, and for the non-commercial harvest of lobster. Regulated fisheries are issued as endorsements on commercial permits. See [Table 23](#) for the number of special permits issued, by type, in 2014 and resulting revenue.

Table 23. 2014 Special Licensing and Revenue Statistics

Permit Type (and resident/non-resident fee)	Permits Issued (#)		Revenue
	Resident	Non-Resident	
Non-Commercial Lobster (\$40/\$60)	7,494	131	\$307,620
Regulated Fishery Endorsements (\$30/\$60)	11,241	693	\$378,810
Master Digger (\$250/\$500)	5		\$1,250
Subordinate Digger (\$100/\$200)	51		\$5,100
Scientific Collection (\$10/\$20)	69	17	\$1,030
"Other" Special Permits (\$10/\$20)	397	1	\$3,990

Non-Commercial Lobster Permit is required to fish for or take lobsters and edible crabs for personal use. This authorizes the holder and members of the holders' immediate family, residing in the same residence, to fish for and take lobsters using 10 pots only. The immediate family is defined as the spouse, parents, children, grandparents, brothers, and sisters of the holder. This permit may be endorsed for diving by the permit holder only. Other family members may purchase additional permits for diving only.

Regulated Fishery Endorsement is required for commercial fishing in certain areas under certain conditions. Regulated fishery endorsement are required for dragging, gillnetting, and netting in inshore net areas, and for setting fish pots in waters under the jurisdiction of the Commonwealth. Regulated fishery endorsements are also required for the commercial harvest of northern shrimp, surf clams, ocean quahogs, sea herring, sea urchins, fluke, black sea bass, scup, striped bass, dogfish, American eel, horseshoe crabs, groundfish, and menhaden.

Master Digger Permit is required for an individual who wants to harvest contaminated clams from areas classified as “restricted”. Shellfish are depurated at the Shellfish Purification Plant in Newburyport in accordance with regulations and established procedures. In addition to this application form, applicants must also include a \$1,000 surety bond, sign a master digger affidavit, have their vehicle inspected and approved by *MassDPH* Division of Food and Drugs, must be at least 18 years of age, and may not possess an “open” area commercial shellfish license at the same time as a Master Digger Permit.

Subordinate Digger Permit is required for the harvest of contaminated clams from areas classified as “restricted”. Shellfish are depurated at the Shellfish Purification Plant in Newburyport in accordance with regulations and established procedures. Subordinate diggers must work for a Master Digger, be at least 18 years of age, and may not possess an “open” area commercial shellfish license at the same time as a Subordinate Digger Permit.

Other Special Permits are required for specific activities in the marine environment, including; aquaculture, scientific collection, shellfish propagation, and shellfish relay.

Point-of-Sale Striped Bass Tagging Program

In accordance with new requirements of the interstate FMP, *Marine Fisheries* implemented a point-of-sale commercial striped bass tagging program prior to the start of the Commonwealth’s 2014 commercial season. The goal of the tagging program was to increase accountability in the supply chain and give law enforcement a tool to detect poaching. Under this program, dealers acting as primary buyers of striped bass were required to affix a tag to all striped bass purchased directly from commercial fishermen. *Marine Fisheries* supplied these tags to dealers at no charge prior to the season and throughout if they needed more. The tags were imprinted with the species, minimum size, year, state, and unique identification number traceable to the Primary Buyer to whom they were issued. At the end of the season, unused tags and an accounting report were required to be submitted to *Marine Fisheries*. The compliance rate was high and, in general, the program ran smoothly in the first year (Table 24).

Table 24. 2014 Striped Bass Tagging Statistics

# of Tags Purchased	# of Tags Distributed	# of Tags Returned	# of Tags Used	Calculated # of Fish*	% Difference Tags Used	# of Dealers Receiving Tags
120,000	92,460	34,057	58,003	58,943	1.59%	125

*Calculated # of Fish = Quota/19.2

Limited Entry Permit Transfer Program

Limited entry permits are those permits and permit endorsements that are restricted in distribution to renewals and are only transferable according to criteria established by regulation. Transfer criteria include two key components: the permit’s activity and the transferee’s experience. Limited entry permits include, but are not limited to, coastal lobster, fish pot (scup, conch and black sea bass), gillnetting, surf clam, ocean quahog, mobile gear coastal access, fluke, horseshoe crab, groundfish, black sea bass and menhaden.

Coastal Lobster Permits can be transferred by the holder along with lobster related business assets under the historical transfer criteria developed for the coastal lobster fishery. A permit must be actively fished prior to the transfer request, where “actively fished” means landing and selling at least 1,000 pounds of lobster or landing and selling lobster on at least 20 occasions, in a single year. The transferee must document that s/he has at least one year of full-time or equivalent part-time experience in the commercial lobster trap fishery or two years of full-time or equivalent part-time experience in other commercial fisheries.

Limited entry endorsements for fish pot-scup, fish pot-conch, fish pot-sea bass, ocean quahog, mobile gear coastal access, fluke, horseshoe crab, groundfish, quahog-dredge, menhaden, and black sea bass can be transferred by the holder provided they have been actively fished for four of the

past five years. “Actively fished” means any landings, unless otherwise determined by the Director in a written policy. For fish pot endorsements, the transferee must document that s/he has at least one year of full-time or equivalent part-time experience in the commercial trap fishery or two years of full-time or equivalent part-time experience in other commercial fisheries. For the other endorsements, the transferee must document that s/he has at least one year full-time or equivalent part-time experience in a commercial fishery.

For 2014, staff developed a new pre-application to allow permit holders to determine their eligibility to participate in a transfer. See [Table 25](#) for a summary of transfers administered by *Marine Fisheries* during the year.

Table 25. 2014 Transfer Statistics (permits with no transfers are not listed)

Permit/Endorsement Type	Permits Transferred (#)	
	Resident	Non-Resident
Coastal Lobster	32	0
Mobile Gear Coastal Access	5	1
Fish Pot	3	0
Fluke	8	1
Sea Bass	2	1
Groundfish	3	0
Surf Clam	1	0
Quahog-Dredge	2	0
Horseshoe Crab	1	0

Recreational Fishing Permit

Marine Fisheries began issuing recreational saltwater fishing permits in December 2010 for the first year of the recreational saltwater fishing permit program. The program was created as a “user-pays, user-benefits” program, insuring all fees collected from the sale of recreational saltwater fishing permits, including permits issued to the for-hire fleet, are deposited into the Marine Recreational Fisheries Development Fund. In addition to permit issuance, many individuals contributed to the program through direct donations for recreational fishing improvements. The number of permitted fishermen showed significant growth in each of the first three years of the program as fishermen became aware of the permit requirement. Permit issuance has continued to rise at about 2.5 to 3% per year for the past three years, but revenue has leveled off as a result of fewer for-hire permits, lower donations, and most of the permit growth in the Age 60+ category (no fee). See [Table 26](#) for the number of permits issued, by type, in 2014 and resulting revenue.

Table 26. 2014 Recreational Saltwater Permitting and Revenue Statistics

Permit Type (and resident/non-resident fee)	Permits Issued (#)		Revenue
	Resident	Non-Resident	
Recreational Saltwater (\$10/\$10)	103,391	14,119	\$1,175,100
Recreational Saltwater Age 60+ (\$0)	40,131	5,497	\$0
Charter Boat (\$65/\$130)	739	42	\$53,495
Head Boat (\$130/\$260)	48	4	\$7,280
Donations			\$38,423
Marine Recreational Development Fund, Total Revenue Collected:			\$1,274,298

Recreational Saltwater Fishing Permit is required of all fishermen age 16 and over. Exceptions have been made for anglers fishing aboard legally permitted for-hire vessels, individuals that are disabled, and for those fishermen with a valid recreational saltwater fishing permit from another coastal state that has entered into a reciprocity agreement with Massachusetts. The fee for the permit has been set at \$10 for fishermen between the ages of 16 and 59, inclusive. The permit is free for fishermen aged 60 and over.

Charter Boat Permit is required for a vessel that can carry up to six persons fishing as passengers from the for-hire vessel.

Head Boat Permit is required for a vessel that can carry seven or more persons fishing as passengers from the for-hire vessel.

Grants Program

In each of FY2013 and FY2014, *Marine Fisheries* spent approximately \$5.5 million on federal grants and mitigation projects operating out of the *Marine Fisheries* Trust account. The Federal Grant Awards and expenditures out of the *Marine Fisheries* Trust are provided in [Table 27](#).

Table 27. Fiscal Year 2013 and 2014 Expenditures

Title of Federal Grant or Trust	Account Number	FY2013	FY2014
Clean Vessel Act	2330-9222	\$1,020,000	\$480,000
Fisheries Statistics	2330-9712	\$30,000	\$100,000
Boating Infrastructure	2330-9725	\$70,000	\$10,000
Interstate Fisheries	2330-9730	\$241,000	\$250,000
ACCSP	2330-9732	\$87,000	\$100,000
MFI Infrastructure	2330-9736	\$0	\$580,000
Economic Relief	2330-9738	\$77,000	\$0
Turtle Disentanglement/Protected Species	2330-9739	\$843,000	\$600,000
Revolving Loan Fund	2330-9741	\$260,000	\$740,000
Fish Age & Growth	2330-9742	\$202,000	\$165,000
Marine Fisheries Research Trust	2330-0101	\$2,715,000	\$2,518,257

The Revolving Loan Fund

In FY2013, *Marine Fisheries* was awarded a \$1,000,000 federal grant to develop and implement a Revolving Loan Fund (RLF) for commercial groundfish fishermen. The Massachusetts Commercial Fisheries RLF Program, operating under a Memorandum of Agreement (MOA) between NOAA Fisheries and *Marine Fisheries*, seeks to promote the effective implementation of catch-share programs in New England, while minimizing any potential adverse socio-economic impacts to fishing communities and small-scale fishing businesses that are sometimes attributed to catch-share programs. Additional loan services to those previously implemented on Cape Cod and the Islands became available in the summer of 2014 for select fishermen on the North Shore and in the Metro Boston/South Shore area when two contracts were entered into with the Cape Ann Commercial Fishermen's Loan Fund and Tremont Credit Union, respectively. Eligible fishermen throughout the Commonwealth are now able to access the full extent of RLF funds through three administrators.

Following expansion of the pilot program in November of 2013 to include loans for vessel repairs, gear purchases, and refinancing of existing fisheries debt, the Community Development Partnership (Cape Cod & Islands RLF Administrator) received three applications. One was turned down as the applicant was not a groundfish fisherman and therefore did not meet the eligibility criteria. The two remaining applicants were approved for a total of \$64,571 to finance a mix of term loans for vessel/gear repair and debt refinancing as well as a line of credit for days-at-sea leasing.

A final grant report was submitted on September 23, 2014. After its acceptance by NMFS, the grant was successfully closed. The RLF Program continues to operate and evolve under the MOA.

Groundfish Disaster Economic Assistance Program

In August 2014, *Marine Fisheries* was awarded a \$6,532,500 federal grant to distribute disaster aid funds to select members of the Commonwealth's federally permitted groundfish fishermen. This first phase of disaster relief ("Bin 1") is part of a greater consensus framework for the distribution of \$32.8-million in federal disaster aid monies to the New England groundfish industry. In the consensus framework, the state fishery directors from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut and New York, in partnership with NOAA Fisheries, announced monies would be apportioned between three themes (roughly \$11 million each): one-third to be used for direct assistance, one-third to be split among the states and used at their discretion, and one-third to be used in developing a federally-funded buyout or industry-funded buyback.

Federal disaster aid stems from a September 2012 disaster declaration in the Northeast multispecies (groundfish) fishery by the Acting Secretary of Commerce. The disaster designation was requested by Governor Deval Patrick and other elected officials recognizing the severe hardships being faced by commercial fishermen—hardships being felt well before the May 1, 2013 federal designation.

Under Bin 1, *Marine Fisheries* disbursed \$6,532,500 in direct subsidies to 201 pre-identified active commercial groundfish fishermen homeported in Massachusetts. Preliminary eligibility was based on a vessel's landing history of at least 5,000 pounds of groundfish, which were allocated to sector and common pool vessels, in any one of the 2010–2013 fishing years. During CY2014, *Marine Fisheries* paid 181 of the 201 eligibilities.

The Clean Vessel Act Program

Marine Fisheries administers the Clean Vessel Act (CVA) Program to ensure that adequate, convenient pumpout facilities are provided to meet the needs of recreational boaters using Massachusetts coastal waters. This is achieved with the addition of new infrastructure and funding sub-grantees for operation and maintenance costs. Responsibilities include the identification of appropriate sites for additional pumpout equipment, making technical assistance and information readily available to boaters and others in need of information regarding the *MassCVA* Program, and agency coordination with public and private parties.

The geography of the Massachusetts coastline, with its hundreds of bays, coves, and inlets, and our short, intense New England boating season, make it fiscally impossible to site enough fixed shore-side facilities to adequately service the total boating population in the coastal zone. Consequently, we have been a leader in the implementation of pumpout vessel use. Our matrix of pumpout vessels and shore-side pumpouts ([Figure 51](#)), along with dump stations, has created much wider boater access along the coast than twice the number of conventional shore-side facilities could have provided, and has been instrumental in Massachusetts' efforts to establish a statewide No Discharge

Area (NDA). In 2014, the 20th year of our participation, *MassCVA* is proud to have helped all of Massachusetts achieve NDA status.



Figure 51. A combination of pumpout boats (left) and fixed location pumpout stations (right) helps meet the needs of the Commonwealth's recreational boaters.

Our capital reinvestment program has enabled *MassCVA* to expand with minimal costs to new sub-grantees that lack the capital for a full investment in new infrastructure. Through this program, when a sub-grantee replaces an existing *MassCVA* pumpout boat or fixed-location station, the replaced equipment is provided to a new applicant who will pay to have it refurbished at a fraction of the cost of new equipment. Our sub-grantees in 2014 included 45 private marinas, three non-profit organizations, and 49 cities and towns.

In 2014, we completed our eighth consecutive year of exhibiting with our public and private partners at the New England Boat Show. Additionally, we partnered with two federal agencies, three state agencies, and more than a half dozen non-profit organizations as part of our information and education efforts.

As a direct result of our outreach and needs assessment efforts to sub-grantees and the general public, program shortfalls are being more effectively identified and addressed. We are quickly approaching the removal of seven million gallons of effluent from state coastal waters. [Table 28](#) summarizes new infrastructure for 2014; the total project costs were \$211,500. In addition, \$749,500 was distributed to 83 sub-grantees to cover the operation and maintenance expenses of 66 pumpout boats and 56 fully functional fixed-location pumpout stations.

Table 28. New Infrastructure for 2014

Recipient	Equipment
Town of Barnstable	Replacement Pumpout Boat
Fiddlers Cove Marina	Replacement Pumpout Station
Vineyard Haven Marina	New Pumpout Boat
Manchester Marine	Replacement Pumpout Boat
City of Gloucester	Replacement Engine
Town of Marion	Replacement Engine

Boating Infrastructure Grant Program

The Massachusetts Boating Infrastructure Grant (*MassBIG*) Program, begun in 2001, is a two-tiered federal grant program, directed through the USFWS and administered by *Marine Fisheries*. The *MassBIG* Program is funded by the Sport Fish Restoration Fund which in turn is funded by a small percentage of the Federal Gasoline Tax—an amount which represents fuel purchased by boaters across the nation. BIG is designed to provide grants to upgrade or install facilities for transient recreational boats 26 feet or more in length at public or partnered private facilities.

Proposed projects filed under Tier II can be much larger in scope than those in Tier I. Unlike Tier I, Tier II proposals are judged in a nationally competitive process based on a strict point system. Both grant tiers are reimbursement grants, meaning that payments are made upon the submission of invoices for work accomplished. Selected applicants provide at least a 25% match for Federal funds received. All payments are based on 75% reimbursement of invoices from work completed.

Three Tier II Proposals were submitted in 2014. The three communities—Gloucester, Newburyport, and Manchester-by-the-Sea—worked diligently with project staff to develop the nationally competitive recreational boating access projects described below.

The City of Gloucester proposes to construct and maintain 72 linear feet of dinghy dock, 75 linear feet of dock for temporary tie-up, and 118 linear feet of dock for pick-up/drop-off for transient recreational boaters as part of their proposed ADA compliant Solomon Jacobs Park Harbormaster Facility located in downtown Gloucester right on Gloucester Harbor.

The City of Newburyport proposes to construct and maintain a Visiting Boater Facility that includes dedicated transient boater bathrooms complete with showers, a visiting boater laundry with washers and dryers, a 382-square foot reception and customer service area, and a 92-foot ADA compliant ramp. The project also includes six additional transient moorings and six additional dinghy dock spaces. This proposed project would be conveniently located along the Merrimack River Riverwalk in downtown Newburyport (Figure 52).



Figure 52. Vessels tied up along the Merrimack River Riverwalk in Newburyport

The Town of Manchester-by-the-Sea proposes to construct and maintain a new ramp and float system to provide new transient docking space for 10 recreational vessels that are 26 feet or longer and their dinghies. The project would allow transient vessels, currently required to anchor or on transient moorings in the outer harbor, to access amenities and services. Lack of dockage is the greatest obstacle to access for visiting vessels. The Town also proposes to provide handicap access via an ADA compliant 80-foot ramp from the pier to the float system.

See [Table 29](#) for a summary of projects completed and in progress in Massachusetts.

Also during 2014, administration of the *MassCVA* and *MassBIG* Programs was joined. Cecil French began as the Coordinator of a newly combined program.

Table 29. Massachusetts BIG Project Summary

Year	Project	Award	% Complete
2001	Nantucket Transient Boater Restrooms (Town Pier)	\$90,413	100%
	Tisbury Transient Dockage & Dinghy Dock (Lake Tashmoo)	\$52,000	100%
2002	Wellfleet Transient Dockage (Town Pier)	\$62,625	100%
	Chatham Transient Moorings & Navigational Aids (Stage Harbor)	\$15,000	100%
2003	Chatham Transient Boater Restrooms (Stage Harbor)	\$69,000	100%
	Beverly Transient Moorings (Great Misery Island)	\$17,394	100%
2004	Boston Harbor Islands Transient Moorings (Long Island)	\$25,000	100%
	Boston Harbor Islands Transient Moorings (Peddocks Island)		
	Owen Park Transient Dockage (Vineyard Harbor)	\$53,752	100%
2005	Provincetown Transient Courtesy Float (MacMillan Pier)	\$60,000	100%
	Nantucket Transient Boater Navigational Aids (Nantucket Harbor)	\$19,382	100%
	Nantucket Transient Boater Navigational Aids (Madaket Harbor)		
2007	New Bedford Transient Navigational Aids & Moorings (New Bedford Harbor)	\$95,000	100%
	New Bedford Transient Dinghy Dock (New Bedford Harbor)		
2009	Scituate Marine Center Transient Access (Scituate Harbor)	\$90,000	100%
2011	Wessagusset Yacht Club Transient Dockage (Fore River, Weymouth)	\$92,250	100%
2013	Wessagusset Yacht Club Transient Dockage Phase II (Fore River, Weymouth)	\$92,250	50%
	Seaport Landing Marina Transient Dockage (Lynn)	\$267,700	10%
2014	Solomon Jacobs Park Harbormaster Facility Project (Gloucester Harbor)	Tier II Proposals submitted in 2014	
	Newburyport Visiting Transient Boater Project (Merrimack River)		
	Manchester by-the-Sea Transient Boater Infrastructure Improvement Project (Reed Park)		

Capital Assets

Facilities

Marine Fisheries maintains facilities at several coastal locations throughout the state. Headquarters are located in Boston, and the two primary field stations are located in Gloucester and New Bedford. Other facilities include the Shellfish Purification Plant in Newburyport, the Hughes Hatchery and Research Facility in Vineyard Haven, a storage facility in New Bedford, and a subsidiary field office and storage facility in Sandwich.

In FY2014, *Marine Fisheries* spent approximately \$188,000 in facility planning, infrastructure maintenance, emergency repairs, and equipment. A new outfall pipe was engineered and installed at the Shellfish Purification Plant, and two new saltwater well pumps were purchased and installed. Architectural plans were developed for a new addition to the Gloucester facility. In addition to emergency repairs of the main water line at the Hughes Hatchery, a new entry door was installed and the roofing was replaced on the second floor roof deck where a weather station is located. A dust collection system, countertops, cabinetry, storage cages, and shelving units were purchased and installed at the new storage facility located in New Bedford.

Vehicles and Boats

Marine Fisheries maintains a fleet of 40 vehicles and 16 boats. In 2014, just over \$45,800 was paid to the Office of Vehicle Management for lease vehicles, and an additional \$43,000 was spent on maintenance and repair for all stock. In addition, two small tin boats with 30-hp motors and trailers were replaced, and one outboard motor was purchased outright in FY2014 for a total cost of \$33,000. No vehicles were replaced in FY2014.

Outreach Program

The *Marine Fisheries* Outreach Program is aimed at establishing a more consistent connection with the Massachusetts saltwater fishing community and general public. Funds for the Outreach Program, including the hiring of an information and education coordinator, are from the Marine Recreational Fisheries Development Fund.

In 2014, the third year of this program, a number of projects were completed. A “Whales of Massachusetts” coloring and activity book was created by the program’s coordinator, Elaine Brewer. She also published one report in the Technical Report series in 2014, and co-edited two issues of DMF News, the *Marine Fisheries* newsletter.

The inaugural “Let’s Go Fishing!” youth fishing clinic was developed and held in August in Yarmouth (Figure 53). It received wide support and praise from local officials and participants. Pre-registered youngsters between the ages of seven and 15 participated in a number of activities, including learning knots, casting practice, and dropping baited lines from the Yarmouth fishing pier.

Outreach was present at various trade shows throughout the year. Informational brochures on research and policy were distributed at the Working Waterfront Festival in New Bedford, New England Boat Show in Boston, and the Fishing and Outdoor Expo in Worcester, among others.



Figure 53. The inaugural “Let’s Go Fishing!” youth angling clinic was held August 2014 in Yarmouth.

MarineFisheries furthered its virtual communication with Massachusetts residents by continuing to communicate with constituents via three social media platforms: Twitter (handle @MassDMF), YouTube (channel MA MarineFisheries), and Flickr (user MA MarineFisheries). *MarineFisheries* uses these platforms to share information regarding policy and research as well as to cross promote with sister agencies within the Commonwealth.

At year’s end, there were 30 videos posted by the agency on the *MarineFisheries* YouTube channel. Brewer worked with *MarineFisheries* biologists to gather video from the field, then edited and produced each for YouTube viewing. In 2013, Northern Light Motion Pictures, Inc was contracted to create three videos outlining recreational angling in Massachusetts waters. Filming was completed and editing under way at year’s end. The videos were scheduled for completion in 2015.

Brewer is a co-webmaster for the *MarineFisheries* pages on Mass.gov, which was migrated to a new platform in 2013. Page content was updated in response to current research and information and will continue to be, moving forward.

Since inception of *MarineFisheries* Outreach, Brewer has been the *MarineFisheries* representative to local and national educational groups including Massachusetts Marine Educators (MME), National Marine Educators Association (NMEA), and National Science Teacher Association. The information and education coordinator is on the Marketing and Communication (chair), and North Shore High School Marine Science Symposium committees, as well as on the Board of Directors for MME; and is the vice-chair for the communications committee on social media for NMEA. The information and education coordinator is also the *MarineFisheries* representative for the New England Ocean Science Education Collaborative.

Brewer also developed the logo for the 2015 Annual National Boating Access Conference (sponsored by the States Organization for Boating Access) and assisted with the logo design and planning for the 2014 International Council for Exploration of the Seas Working Groups on Fishing Technology and Fish Behaviour, and Fisheries Acoustics, Science, and Technology held in New Bedford.

Seafood Marketing

MarineFisheries increased its seafood marketing activities in 2014. The UMass-Dartmouth Center for Marketing Research was contracted to conduct a consumer survey on seafood perceptions and consumption habits among Massachusetts residents to help inform future marketing activities. *MarineFisheries* also partnered with NOAA Fisheries and the New England Fishery Management Council to produce and publish a “Seafood 101” insert for the Boston Globe, which aimed to educate the public about the healthy seafood options available in New England (Figure 54).

Additional activities in 2014 included: participation in the NOAA Fisheries Seafood Steering Committee; convening a meeting of industry stakeholders to discuss seafood marketing needs in Massachusetts; staffing a booth at the Boston Seafood Festival; and meeting with numerous stakeholders throughout the year to discuss marketing efforts.

On August 13, 2014, Governor Deval Patrick signed into law “An Act Promoting Economic Growth Across the Commonwealth,” which, in part, established a Seafood Marketing Program within *Marine Fisheries*. The establishment of the Seafood Marketing Program is a direct result of the recommendation made by a special commission on seafood marketing tasked by the legislature to investigate the merits of developing a Massachusetts seafood marketing program, as well as Senate Bill 1979, “An Act Establishing a Massachusetts Seafood Marketing Program,” filed by Senator Bruce Tarr in 2013. The legislation lays out initial objectives for the program including: increasing the public’s knowledge about the health benefits of consuming seafood, educating the public on fisheries management, creating name recognition for the Commonwealth’s seafood products, stabilizing market prices, and developing a coordinated marketing strategy.

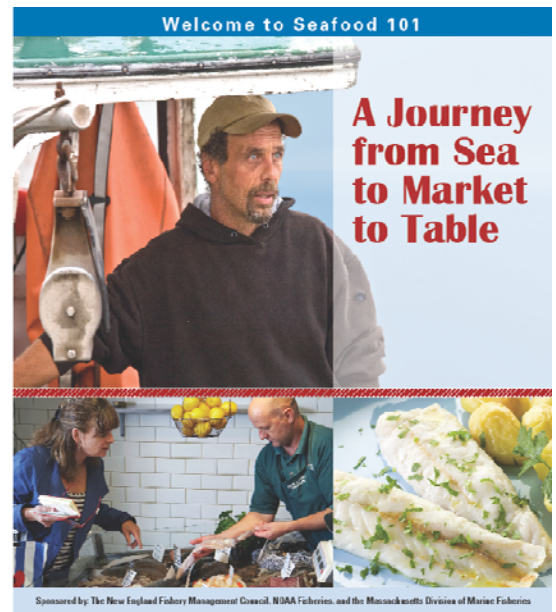


Figure 54. The cover of the Seafood 101 insert published in the Boston Globe.