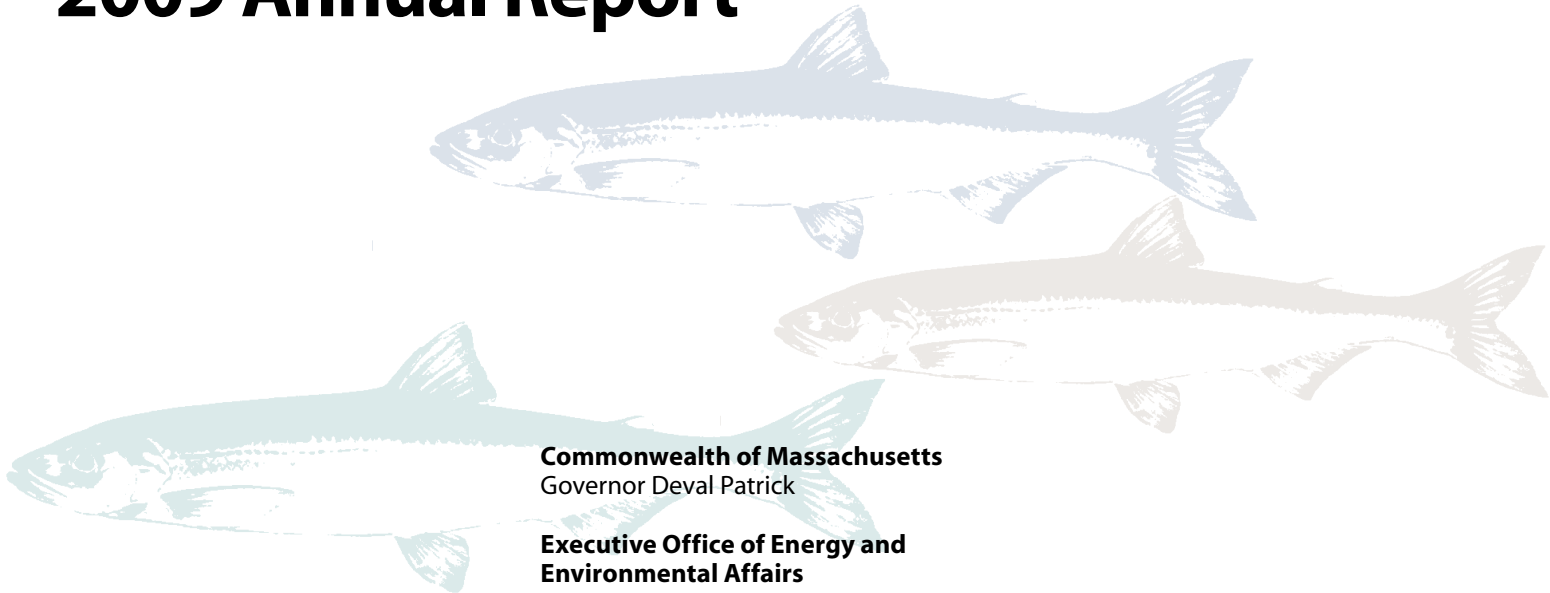


Department of Fish and Game
Massachusetts Marine Fisheries
2009 Annual Report



Department of Fish and Game Massachusetts Division of Marine Fisheries 2009 Annual Report



Commonwealth of Massachusetts
Governor Deval Patrick

**Executive Office of Energy and
Environmental Affairs**
Secretary Ian A. Bowles

Department of Fish and Game
Commissioner Mary B. Griffin

Division of Marine Fisheries
Director Paul J. Diodati

Daniel J. McKiernan
Deputy Director

David Pierce
Deputy Director

Kevin Creighton
Chief Financial Officer

www.mass.gov/MarineFisheries

January 1 - December 31, 2009

Marine Fisheries
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 laws 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.

Financial Report Budget, Staff, and Revenue

Personnel:

Boston Office

Kevin Creighton, Chief Fiscal Officer
Darlene Pari, Accounts Payable Coordinator
Jeanne Hayes, Accounts Receivable Coordinator
Kerry Allard, Head of Permitting
Eva Morales, Accountant III
Cecil French, Permitting Supervisor
Kerry Faugno, Permitting Receiving Teller
Sandra Downing, Permitting Receiving Teller

New Bedford Office

Marie Callahan, Permitting Office Manager
Kim Trotto, Permitting and Administrative Support

Gloucester Office

Rosemary Mitchell, Permitting and Administrative Support

Overview:

The Division of Marine Fisheries (*Marine Fisheries*) has a number of performance requirements that it must meet in order to achieve its basic goals and objectives. These include completing fisheries research, assessment, and management evaluations mandated by over 30 federal and state fishery management plans, oversight of the state's shellfish classification and management program, permitting, affording habitat and fisheries protection through our habitat assessment program, and shepherding the collection and management of fisheries statistics.

Budget: State-Appropriated Funds

The United States was gripped in a financial crisis that began in 2007 and culminated with Lehman Brothers filing for bankruptcy on September 15, 2008. The Commonwealth's 2009 fiscal year began July 1, 2008, and budget projections were not met. As the impacts of the financial crisis were realized across the country, Governor Deval Patrick had to reassess the Commonwealth's budget projections after the first quarter of FY2009, resulting in cuts across many line items in the state's budget. Throughout the remainder of FY2009, budget projections continued to spiral downward, and *Marine Fisheries* FY2009 budget reduced on three occasions. The fiscal year 2008 and initial 2009 state appropriations are shown in Table 1.

Table 1. Fiscal Year 2008 and Initial 2009 Appropriations.

Title	Acct. Number	FY2008	FY2009	Change
<i>Marine Fisheries</i> General Operating	2330-0100	\$4,972,695	\$5,700,068	+14.6%
Sport Fish Program	2330-0120	\$598,704	\$609,040	+1.7%
Sport Fish Retained Revenue	2330-0121	\$217,989	\$217,989	0
Total		\$5,789,388	\$6,527,097	+12.7%

Marine Fisheries' budget for fiscal year 2009 included several earmarks totaling \$237,000, the creation of a "green fishing initiative" program, and allowed for the backfill of four vacant positions. As a result of the three (so-called "9C") cuts enacted over the course of fiscal year 2009, earmarks were reduced to \$60,000, and *Marine Fisheries* had to eliminate all planned growth (Table 2). The final budget for fiscal year 2009 reflected a modest increase of 1.07% over the state-appropriated budget for fiscal year 2008, but was insufficient to meet the increased costs due to inflation (Table 3, Figure 1).

Table 2. Appropriations for Fiscal Year 2008 and 2009, post 9C reductions.

Title	Acct. Number	FY2008	FY2009	Change
<i>Marine Fisheries</i> General Operating	2330-0100	\$4,972,695	\$5,062,311	+1.8%
Sport Fish Program	2330-0120	\$598,704	\$571,063	-4.6%
Sport Fish Retained Revenue	2330-0121	\$217,989	\$217,989	0
Total		\$5,789,388	\$5,851,363	+1.07%

Table 3. Fiscal Year 2009 Costs, State Appropriations.

Account Number	2330-0100	2330-0120	2330-0121	Line Total
Salaries	\$4,042,664.03	\$555,817.75	\$16,572.67	\$4,615,054.45
Employee Expenses	\$24,749.98	\$2,497.66	\$6,414.83	\$33,662.47
Contracts	\$9,976.99		\$30,730.90	\$40,707.89
Facility Maintenance	\$36,591.55		\$9,893.80	\$46,485.35
Field & Lab Supplies	\$55,753.11	\$915.00	\$24,781.78	\$81,449.89
Fringe Costs	\$88,599.13	\$7,281.22	\$217.10	\$96,097.45
Fuel	\$59,531.05			\$59,531.05
Utilities	\$137,730.70			\$137,730.70
Lease/Rent	\$72,935.57			\$72,935.57
Maintenance/Repair	\$52,946.82		\$4,532.73	\$57,479.55
Office & Administrative	\$98,882.83	\$704.00	\$57,090.08	\$156,676.91
Services/ Equipment Lease	\$13,125.22		\$12,756.00	\$25,881.22
Information/ Technology	\$58,893.20	\$2,500.00	\$10,052.01	\$71,445.21
Government Contracts	\$57,993.00		\$44,130.86	\$102,123.86
Outside Agencies	\$179,619.60		\$507.59	\$180,127.19
Grants	\$60,000.00			\$60,000.00
Total	\$5,049,992.78	\$569,715.63	\$217,680.35	\$5,837,388.76

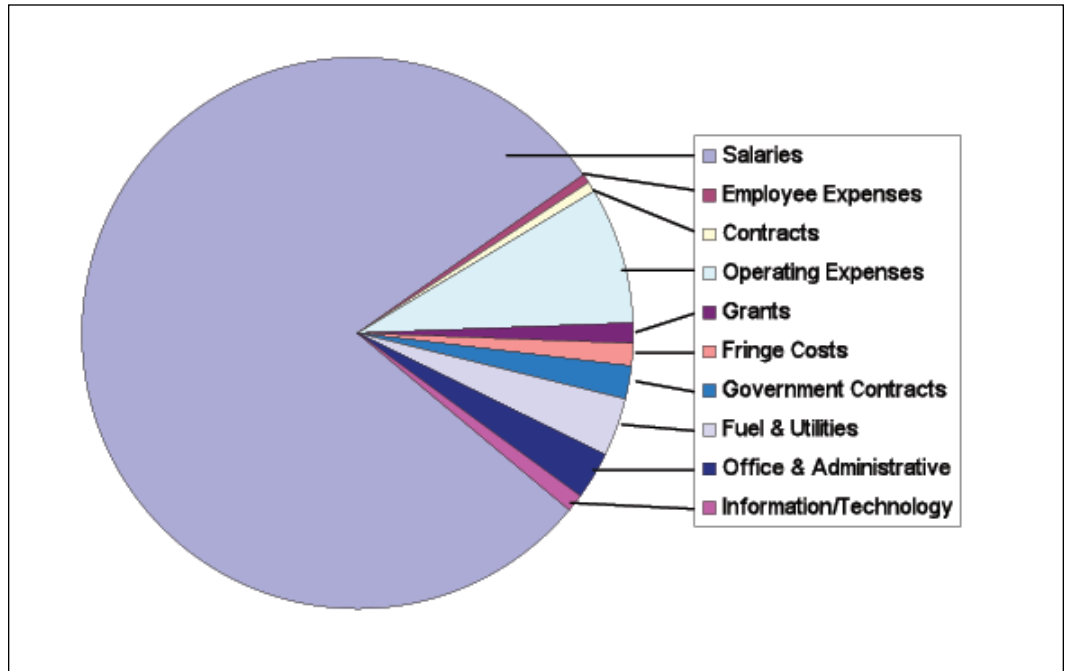


Figure 1. FY2009 Spending Category Summary.

Budget: Federal Assistance and Trust Funds

Over the past several years, *Marine Fisheries* has spent approximately 4 million dollars annually on federal grants and mitigation projects operating out of the *Marine Fisheries* Trust account. In fiscal year 2009 *Marine Fisheries* received a grant providing economic relief to commercial groundfish fishermen as a result of the federal enactment of Framework Adjustment 42 to the Northeast Multispecies Fishery Management Plan. The Framework 42 Economic Assistance Grant was valued at over 13 million dollars, resulting in a dramatic increase in overall federal grant spending for that fiscal year. The Federal Grant Awards and expenditures out of the *Marine Fisheries*' Trust are shown in Table 4.

Table 4. Fiscal Year 2008 and 2009 Appropriations.

Title of Federal Grant or Trust	Acct. Number	FY2008	FY2009
Clean Vessel Act	2330-9222	\$850,000	\$850,000
Fisheries Statistics	2330-9712	\$185,000	\$135,000
Right Whale Conservation	2330-9713	\$250,000	\$340,000
Anadromous Fisheries	2330-9721	\$27,000	\$22,000
Boating Infrastructure	2330-9725	\$100,000	\$100,000
Lobster Investigations	2330-9726	\$50,000	\$60,000
Interstate Fisheries	2330-9730	\$233,000	\$233,000
Economic Relief to Fishermen	2330-9741	\$100,000	\$12,000,000
Turtle Disentanglement	2330-9739	\$25,000	\$40,000
Marine Fisheries Research Trust	2330-0101	\$1,970,000	\$1,960,000

Staffing

Authorized personnel levels are shown in Table 5:

Table 5. Fiscal Year 2008 and 2009 Authorized Personnel Levels.

Title	Acct. Number	FY2008	FY2009
Marine Fisheries General Operating	2330-0100	74	75
Sport Fish Program	2330-0120	10	10
Federal Grants and Trust Account	2330-xxxx*	17	14
Total Employees in All Appropriations		101	99

*Multiple account numbers

Revenue

Marine Fisheries collects fees primarily from permit issuance and from processing racks of soft-shelled clams at the Shellfish Purification Plant. A total of 37,857 permits and endorsements were issued by the Licensing Program producing revenue of \$2,130,845 in 2009. This represents a slight increase (less than 1%) in revenue from permit issuance in 2008. The Shellfish Purification Plant in Newburyport processed 14,993 racks of soft-shelled clams in 2009. This resulted in revenues of \$89,958, which is an 11% increase over the 2008 value of \$80,784.

Commercial Fishermen Permits

Anyone who lands and sells finfish, shellfish, lobsters, edible crabs, or other living marine resources in Massachusetts must have a *Marine Fisheries* commercial fisherman 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 6 for the number of commercial fishermen permits issued, by type, in 2009 and resulting revenue.

Table 6. 2009 Commercial Licensing and Revenue Statistics.

Permit Type (and resident/non-resident fee)	Number Permits issued:		Revenue
	Resident	Non-Resident	
Coastal Lobster (\$260/NA)	1,307	7	\$343,460.00
Offshore Lobster (\$260/\$520)	360	113	\$152,360.00
Seasonal Lobster (\$65/\$130)	151	2	\$10,075.00
Boat 99'+ (\$260/\$520)	15	19	\$13,780.00
Boat 60-99' (\$195/\$390)	69	131	\$64,545.00
Boat 0-59' (\$130/\$260)	2,757	277	\$430,430.00
Individual (\$65/\$130)	367	16	\$25,935.00
Shellfish (\$40/\$80)	1,083	24	\$45,240.00
Shellfish & Rod & Reel (\$55/\$130)	531	3	\$29,595.00
Rod & Reel (\$35/\$100)	794	88	\$36,590.00

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 (LMA) 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 only, 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 (LMA) 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 - Sept. 15. A maximum of 25 pots may be used. Diving is not permitted, nor is the sale of fish and/or shellfish.

Boat Permits allow the taking, landing and sale of fish (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 fish (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 and reel only. No other gear types may be used.

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 Department of Public Health. Shellfish dealers must check Food and Drug regulations for tagging and record keeping. Massachusetts seafood dealers who purchase seafood products, even if for bait purposes, directly from fishermen are considered a primary buyer, and must be so endorsed on their dealer permit. See Table 7 for the number of dealer permits issued, by type, in 2009 and resulting revenue.

Table 7. 2009 Dealer Licensing and Revenue Statistics.

Permit Type (and resident/non-resident fee)	Number Permits issued		Revenue
	Resident	Non-Resident	
Wholesale Dealer (\$130/\$260)	361	8	\$49,010.00
Wholesale Truck (\$130/\$260)	91	88	\$34,710.00
Wholesale Broker (\$130/\$260)	25	1	\$3,510.00
Retail Dealer (\$65/\$130)	713	1	\$46,475.00
Retail Truck (\$65/\$130)	46	3	\$3,380.00
Retail Boat (\$65/\$130)	69		\$4,485.00
Bait Dealer (\$65/\$130)	151	12	\$11,375.00

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. 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), the inspection must specifically state, "Approved for retail and Bait License". Requires a Hazard Analysis and Critical Control Points (HACCP) plan.

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. Does not allow the holder to process raw fish, whether frozen or unfrozen, lobster or shellfish. Does not 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. Does not allow the holder to shuck, re-label 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). 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. Contact the Division of Standards at (617) 727-3480 for further information.

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 (e.g., on worms, eels) 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 8 for the number of special permits issued, by type, in 2009 and resulting revenue.

Table 8. 2009 Special Licensing and Revenue Statistics.

Permit Type (and resident/non-resident fee)	Number Permits issued		Revenue
	Resident	Non-Resident	
Non-Commercial Lobster (\$40/\$60)	9,789	217	\$404,580.00
Regulated Fishery Endorsements (\$30/\$60)	15,876	1,000	\$394,860.00
Master Digger (\$250/\$500)	8		\$2,000.00
Subordinate Digger (\$100/\$200)	83		\$8,300.00
Scientific Collection (\$10/\$20)	71	20	\$1,620.00
"Other" Special Permits (generally \$10/\$20)	295		\$5,670.00
For-Hire Endorsement (\$10/\$20)	744	71	\$8,860.00

Non-Commercial Lobster Permit is required to fish for or take lobsters and 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 permits 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 permits 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 and groundfish. Rules and regulations on these permits are available from the *Marine Fisheries*' Boston office.

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 the Department of Public Health, Division of Food and Drugs, and they 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, they must be at least 18 years of age, and may not possess an "open" area, commercial shellfish license at the same time as a subordinate diggers permit.

Other Special Permits are required for specific activities in the marine environment, including aquaculture, scientific collection, shellfish propagation, and shellfish relay. Rules and regulations on these permits are available from the *Marine Fisheries* Boston office.

For-Hire Endorsement authorizes the named individual or corporation's vessel to carry paying customers for purposes of fishing. Individuals or corporations shall obtain a for-hire permit based on the number of paying customers aboard: Guide Boat – up to two; Charter Boat – three to six; Head Boat – seven or more.

Policy and Fisheries Management

Personnel:

Paul Diodati, Director
David Pierce, Deputy Director
Dan McKiernan, Deputy Director
Kevin Creighton, Chief Financial Officer
Kerry Swallow, Program Coordinator II
Steve Correia, Senior Marine Fisheries Biologist
Dave Borden, Senior Fisheries Management Specialist
Melanie Griffin, Fisheries Management Specialist
Jeanne Hayes, Accountant IV
Jared Silva, Program Coordinator



Overview:

The Division of Marine Fisheries (*Marine Fisheries*) of the Department of Fish and Game is the state agency responsible for managing the Commonwealth's commercial and recreational fisheries. Management of marine resources unique to state waters and that 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 recreational and commercial fisheries, compose 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, New England Fisheries Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC) fishery management plans 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/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.

Policy and Fisheries Management Activities

Regulatory Promulgation

Marine Fisheries and the Marine Fisheries Advisory Commission conducted nine public hearings or comment periods in 2009 to implement regulatory changes affecting fisheries for bay scallops, pelagic species, striped bass, lobster, spiny dogfish, multispecies groundfish, summer flounder (fluke), scup, black sea bass, blue crabs, coastal sharks, and rainbow smelt, in addition to complementing federal regulations that are part of the Harbor Porpoise and Atlantic Large Whale Take Reduction Plans. Also, *Marine Fisheries* hosted five public hearings on ASMFC Interstate Fishery Management Plan (FMP) amendments or addenda.

Rulemaking changes of note in 2009 include:

- Revised bay scallop shell size restrictions (322 CMR 6.11) to clarify the position of the annual growth ring (10 mm) to distinguish between “seed” vs. “adult” bay scallops, and an exemption to allow harvest of adult scallops of a certain shell height (2.5 in.) if the growth ring lies closer than 10 mm from the shell origin. This change allowed Nantucket bay scallop industry to capitalize on an abundant 2008 year class of scallops that were in their second year, but due to a late set, featured many scallops with a growth ring closer than 10 mm.
- Revised blue crab conservation measures to reduce the per person bag limit from 50 to 25 crabs, and increase the minimum size to 5” carapace width. Because recreational blue crab harvest is an activity that requires no permit, new outreach materials were developed for widespread distribution.
- Enactment of a rainbow smelt bag limit of 25 fish per angler. Smelt are at extremely low levels and are the focus of intense restoration efforts. This rule prevents directed fisheries (recreational and commercial) from undermining the restoration program.
- Revised inshore net regulations governing harvest of pelagic species (322 CMR 4.00, 6.00, 7.00 & 8.00). These amendments created consistent rules for the use of surface gillnets and cast nets and streamlined the permitting process for 250 to 300 fishermen who harvest pelagic species (e.g. menhaden) for personal or commercial use.
- Revised striped bass commercial regulations enabling for-hire vessel captains conducting charters to filet bass for customers and dispose of striped bass racks at sea (322 CMR 6.07). Private anglers are not allowed to filet bass at sea.
- Establishment of a Spring Cod Conservation Zone (322 CMR 8.15) in Massachusetts Bay off Manchester. Based on *Marine Fisheries’* research a substantial seasonal (spring) spawning aggregation was identified and protected through a 2-month closure to all cod harvest. This is the second cod closure in a discrete area.
- Lower commercial and recreational possession limits for winter flounder (322 CMR 6.03) to compliment federal actions.

Marine Fisheries Advisory Commission

The MFAC elected Mark Amorello its Chair in January of 2009. The MFAC submitted three letters during the year regarding recreational saltwater licensing and striped bass gamefish status.

The MFAC presented the Belding Award to Dick Quinn at its September 3rd meeting. Dick is a well known federal expert in anadromous fish passage and fishway construction.

Red Tide Assistance Program

Marine Fisheries spent much of spring 2009 developing a lost income subsidy program to help fishermen affected by the previous year’s red tide bloom. In 2008 off the mid-coast of Maine, there was an extensive and continual bloom of the naturally occurring *Alexandrium fundyense*, the red tide algae. Nutrient loading from a large spring run-off accelerated the algae’s growth and persistent easterly winds blew the bloom inshore towards the most productive shellfish beds. The strong western Maine current pushed this bloom to the south, and by early spring it had advanced into the waters of the Commonwealth. As the bloom grew in geographic extent the concentration of saxotoxin, the neurotoxin responsible for paralytic shellfish poisoning, rose.

In accordance with the National Shellfish Sanitation Program, *Marine Fisheries* began to close shellfish beds throughout the state. Closures were maintained through the peak of the shellfish season, affecting 39 coastal communities, 29 with commercial industries. The resultant economic loss was estimated at \$1.2 million in ex-vessel value (wholesale value paid to fishermen for their catch).

In September 2008, Governor Deval Patrick requested federal disaster relief to aid affected shellfish fishermen, and the Commonwealth was granted \$2 million through US Secretary of Commerce Carlos M. Gutierrez.

By the end of 2009, all subsidy payments had been issued; 263 eligible applicants, from 44 different communities, were provided with funding. A total of \$1,118,651.65 was disbursed

to these individuals, constituting 100% of their estimated loss. With the \$800,000 allocated to technical assistance *Marine Fisheries* worked to renovate the shellfish laboratory, hire additional red tide biologists, and fund a cyst-bed mapping program by the Woods Hole Oceanographic Institute. The objective was to limit future losses by having more precise information available to implement smaller and more surgical closures.

Scallop EcoLabel

In May of 2009 *Marine Fisheries* responded to an industry request to develop an ecolabel promoting sustainable fisheries products. This proposal was brought before *Marine Fisheries* by representatives of the American Scallop Association (ASA) during a meeting in New Bedford on April 9, 2009 with ASA's General Counsel Harvey Mickelson and Dr. Brian Rothschild of the University of Massachusetts' Graduate School for Marine Science and Technology. *Marine Fisheries* concluded that certification standard should be verified and product certified by an independent third-party – not the government agency directly responsible for developing and implementing sustainable fishing regulations.

Groundfish Interim Action

Marine Fisheries formally responded to the National Marine Fisheries Service's (NMFS) intent to adopt an Interim Action for management of groundfish, anticipating the implementation of Framework 42. In the response *Marine Fisheries* objected to the proposed closure of the Southern New England/Mid-Atlantic (SNE/MA) area in order to conserve winter flounder stocks. It was believed that closing this area would shift effort into other regions and fisheries and would reduce yield optimization across northeast fisheries, particularly in the SNE/MA area. NMFS decided not to implement this closure.

Groundfish Framework 42 Lawsuit

In January 2009, the Honorable Edward J. Harrington issued a temporary order in *Marine Fisheries'* case against the US Secretary of Commerce regarding the impacts of Framework 42, the federal FMP for the multi-species groundfish complex. The Office of the Attorney General represented *Marine Fisheries* in this litigation. The provisions of the FMP were suspended for 60-days by Judge Harrington in order for NMFS to re-evaluate the mixed stock exception, which prevents yield loss across the complex due to effort restrictions on one stock. The court lifted its suspension despite the NEFMC protesting its involvement in the NMFS review. The lawsuit concluded in April 2009, when Judge Harrington issued an Order of Dismissal.

Amendment 16 to the Northeast Multispecies Fishery Management Plan

Throughout 2009, *Marine Fisheries* was involved in the development and adoption of Amendment 16 to the Multispecies FMP submitted to NMFS that October. This Amendment adopted a broad suite of management measures to achieve fishing mortality targets and meet requirements of the Magnuson-Stevens Reauthorization Act (MSRA), especially the setting of annual catch levels and accountability measures. A centerpiece of the Amendment was the establishment of widespread groundfish sector management; this involves fishermen forming groups (sectors) that manage their own effort and landings to stay within hard quotas based on members' catch history.

To help understand the unintended consequences of Amendment 16, especially the formation of sectors, University of Rhode Island professor Dr. Seth Macinko was contracted to prepare an analysis of the program during its development. That report was shared with NEFMC members and staff as well as NMFS.

Spiny Dogfish

The ASMFC, with guidance and pressure from *Marine Fisheries*, increased the coastal spiny dogfish quota from 12 to 15 million pounds for the fishing year of May 1, 2010 through April 30, 2011. A Northeast Fisheries Science Center report on spiny dogfish demonstrated female stocks were rebuilt, prompting the call for an increase in quota.

Atlantic Sea Herring

At the request of *Marine Fisheries*, the NEFMC's Science and Statistical Committee (SSC) revised the conclusion that the 2010-2012 acceptable biological catch (ABC) should be set at 90,000 mt (60% of the overfishing level) for all areas (Gulf of Maine, Georges Banks, Southern New England/Mid-Atlantic). This ABC, set by the SSC, was a stark reduction in quota from past years; *Marine Fisheries* suggested the quota reduction was unnecessary because the stock was not overfished and overfishing was not occurring. Consequently it was suggested that the SSC review the handling of uncertainty in the stock assessment. After review by the SSC, the ABC was increased to 106,000 mt, a level that still represented a major decrease in allocable catch from recent years. Economic forecasts demonstrate catch landing reductions may have serious effects on the sea herring fishery and the bait-dependent lobster fishery.

Scallop Framework 21

In December 2009, the impending Framework 21 to the Atlantic Sea Scallop FMP looked to impose a 22% reduction in days-at-sea for the Atlantic sea scallop industry. *Marine Fisheries* advised the NEFMC to maintain the status quo for effort management. This approach was believed to be reasonable, scientifically defensible, supported by industry and based on the recent success in management.

Governor Deval Patrick provided vocal public support for *Marine Fisheries'* petition. The NEFMC chose to vacate the reduction and uphold the status quo. This action prevented the loss of millions of dollars of sea scallop landings and associated shore-side value and economic benefits.

Petition to Ban Trade in Atlantic Bluefin Tuna

Marine Fisheries opposed an ultimately unsuccessful petition to ban international trade of Atlantic bluefin tuna. Monaco had petitioned to list Atlantic bluefin tuna (ABT) under Appendix I of the Convention on the International Trade of Endangered Species of Wild Fauna and Flora. The management of Atlantic bluefin tuna rests with the International Commission for the Conservation of Atlantic Tunas (ICCAT), and *Marine Fisheries* maintained that ICCAT and National Oceanic and Atmospheric Administration (NOAA) should be allowed to finish the job of rebuilding our shared, valuable bluefin fisheries under new conservation agreements reached in November of 2009.

Strategic Planning

Work continued on a *Marine Fisheries* 5-year Strategic Plan. This Plan comes at a time when management of the Commonwealth's marine fisheries and protection of marine habitat have entered a new phase with a different set of challenges and opportunities created by the 2006 MSRA and the Commonwealth's 2009 Ocean Management Plan. *Marine Fisheries'* strategic planning will recognize the requirement, emphasized by Governor Deval Patrick and Senate President Theresa Murray, that the Commonwealth's "first-in-the-nation comprehensive plan to manage development in its state waters will balance natural resource preservation with traditional and new uses, including renewable energy."

Ocean Management Plan

Marine Fisheries continued to participate on the Ocean Advisory Commission and Ocean Science Advisory Committee towards development of a comprehensive ocean management plan as required by the Commonwealth's 2008 Oceans Act.

Stellwagen Bank Sanctuary

Marine Fisheries continued to contribute to development of a Final Management Plan for the Stellwagen Bank National Marine Sanctuary emphasizing three objectives pertinent to *Marine Fisheries* and NEFMC fisheries managers: (1) reduced alteration of benthic habitat by mobile gear fishing, (2) reduced ecological impacts of biomass removal by fishing, and (3) a final plan that is both reasonable and accommodating to stakeholders.

Ghost Gear and Marine Debris Removal

Marine Fisheries biologist, Bruce Estrella, initiated a review of Massachusetts statutes and regulations, and those of other states, and ghost gear and marine debris documents to investigate means by which gear removal from coastal waters and shorelines can be legally facilitated. A treatise on ghost gear and marine debris removal, a list of pertinent literature, and recommendations to facilitate gear removal from the ocean and shoreline was thereafter completed and forwarded to department legal counsel for review.

Policy Updates

In 2009 *Marine Fisheries* issued the following new policies:

- Eelgrass (*Zostera marina*) Restoration and Monitoring Technical Guidelines; and
- Lobster Permit and Trap Transfer Policies for 2010 (and beyond) consistent with ASMFC Interstate Lobster Plan Addendum XII

Legislation Enacted in 2009

Recreational Saltwater License: On November 4, 2009, the Commonwealth of Massachusetts passed “An Act Instituting Saltwater Fishing Licenses” in response to a 2006 federal rule requiring registration of saltwater recreational fishermen beginning in 2010. The federal rule is aimed at improving the quality of data used to estimate the effects of recreational fishing on ocean resources and the nation’s economy. The state bill requires *Marine Fisheries* to implement a new state permit for saltwater recreational fishermen by 2011. This change is significant as it represents the first time ever that marine recreational fishermen in Massachusetts will be required to purchase a permit, similar to their inland counterparts fishing in fresh water. Support for the act was driven by a large group of recreational stakeholders seeking a state permitting program that would exempt anglers from the more expensive federal permit in 2011 and ensure license revenues went to local user benefits. Representatives of the recreational fishery advocated strongly, and successfully, for a state program including services to enhance public access for saltwater sportsmen and improving fisheries management.

Publications

DMF News: This *Marine Fisheries*’ newsletter was published once in 2009. Volume 30 (1st – 4th Quarter) is available at: <http://www.mass.gov/dfwele/dmf/publications/dmfnq409.pdf>

Marine Fisheries Technical Report Series: B. Estrella was assigned Scientific Editor to improve the timeliness and quality of the *Marine Fisheries* Technical Report Series. Four manuscripts were edited and readied for publication in the Series during 2009: “Eelgrass Restoration Used as Construction Impact Mitigation in Boston Harbor, Massachusetts, TR-37”; “Massachusetts Division of Marine Fisheries Trawl Survey Effort, Lists of Species Recorded, and Bottom Temperature Trends, 1978 – 2007, TR-38”; “Seafloor Sediment Composition in Massachusetts”, in prep., and “Quality Assurance Program Plan”, in prep. Two other manuscripts were published in the Series earlier in 2009: “Boston Harbor Artificial Reef Site Selection and Monitoring Program, TR-35” and “Massachusetts Striped Bass Monitoring Report for 2008, TR-36”.

DMF 2008 Annual Report: The 2008 Annual Report was completed for publication in 2009, and is available at: http://www.mass.gov/dfwele/dmf/publications/2008_dmf_annual_report.pdf. B. Estrella reviewed and edited the individual program reports to reflect the primary focus/objectives and accomplishments of each program.

Awards and Appointments

Director Paul Diodati was elected Vice-Chair of the ASMFC (2010-2011).

Deputy Director David Pierce holds the NEFMC Scallop Committee chairmanship.

Shellfish Sanitation and Management Program

J. Michael Hickey, Program Manager

Personnel:

South Shore

Section Leader Position: Vacant

Jerry Moles, Marine Fisheries Biologist

Neil Churchill, Marine Fisheries Biologist

John Mendes, Marine Fisheries Biologist

Terry O'Neil, Marine Fisheries Biologist

Gregory Sawyer, Marine Fisheries Biologist

Jim Rossignol, Lobster Culturist

Mike Syslo, Senior Fisheries Biologist, Lobster Hatchery

Ross Kessler, Marine Fisheries Biologist

Susan Boehler, Laboratory Supervisor

North Shore

Jeff Kennedy, Senior Marine Fisheries Biologist, North Shore Section Leader,
Depuration Plant Manager

Gregory Bettencourt, Assistant Marine Fisheries Biologist

Glenn Casey, Marine Fisheries Biologist

David A. Roach Jr., Marine Fisheries Biologist

Thomas Shields, Project Supervisor, Boston Harbor Clam Restoration

Paul Somerville, Marine Fisheries Biologist

Devon Winkler, Marine Fisheries Biologist

Florence Pettengill/Cenci, Laboratory Supervisor

Ashley Silberzweig, Laboratory Assistant

Christopher Schillachi, Contact Fisheries Technician

Newburyport Shellfish Purification Plant

Diane Regan, Laboratory Supervisor

Vivian Kookan/Lasnier, Laboratory Assistant

Ralph A. Stevens Jr., Plant Foreman

Richard Hardy, Laborer

Peter Kimball, Laborer

Albert Thistlewood, Assistant Plant Foreman

Paul Thistlewood, Laborer



Overview:

The Shellfish Sanitation and Management Program (Shellfish Program) has two primary missions, public health protection and both direct and indirect management of the Commonwealth's molluscan shellfish resources. Public health protection is afforded through the sanitary classification of all 1,744,041 acres of overlying waters within the states territorial sea and Nantucket Sound. The National Shellfish Sanitation Program (NSSP) is a federal/state cooperative program recognized by the U. S. Food and Drug Administration (FDA) and the Interstate Shellfish Sanitation Conference (ISSC) for the sanitary control of shellfish produced and sold in interstate commerce for human consumption.

Shellfisheries management is accomplished by direct *Marine Fisheries* regulation of the commercial surf clam, ocean quahog and quahog dredge boat fisheries, harvest of contaminated shellfish for depuration and relaying, setting size and maximum harvest limits for other shellfish and seasons in the case of bay scallops and conchs. *Marine Fisheries* also regulates shellfish aquaculture and is required to certify that operation of private shellfish aquaculture projects at sites licensed by coastal municipalities will not have any adverse impact on shellfish or other natural resources of the city or town. Indirectly, *Marine Fisheries* manages through its partnership with the coastal communities by providing technical assistance in consultation with local management authorities (elected officials and shellfish constables) in the development of management plans and regulations to protect and conserve shellfish and by providing information pertaining to increasing the supply of shellfish and protection from predators and shellfish diseases.

Sanitation – Public Health Protection

Shellfish Sanitation

Public Health protection is achieved as a result of sanitary surveys of shellfish growing areas to determine their suitability as sources of shellfish for human consumption. Sanitary surveys include: 1) evaluation of all pollution sources that may affect an area, 2) evaluation of hydrographic and meteorological characteristics that may affect distribution of pollutants, and 3) an assessment of water quality.

Each shellfish growing area must have a complete sanitary survey every 12 years, an evaluation every three years, and an annual review in order to maintain a classification which allows shellfish harvesting. Minimum requirements for each of the evaluations noted above and annual water quality monitoring are established by the ISSC and set forth in the NSSP. Each year the South Shore segment of the program collects samples from 1,256 stations in 261 growing areas located in 41 coastal cities and towns at a minimum frequency of five times a year. In 2009, 6,598 water samples were collected on the South Shore and analyzed by *Marine Fisheries* New Bedford laboratory. On the North Shore, water samples are collected from 238 stations in 17 shellfish growing areas in 16 communities at the same frequency. A total of 3,333 water samples were collected in 2009 and analyzed at the *Marine Fisheries* Gloucester laboratory. Coastwide, a total of 9,931 water samples were collected from 1,494 stations in 278 shellfish growing areas in 57 communities.

In 2009, Shellfish program biologists completed 292 annual evaluation reports for growing areas or classification sub-units of growing areas, 49 triennial evaluations, 21 sanitary surveys, and 10 additional annual conditional rainfall management plan evaluations.

Shellfish are also tested for bacterial quality and various contaminants based on assessment of pollution sources impacting growing areas as determined by the sanitary survey and also as a result of pollution events such as oil spills and chemical spills or discharges. In 2009, 33 shellfish samples from growing areas were analyzed for bacterial quality, 28 from the South Shore and 5 from the North Shore. In addition to these 33 samples, another 573 shellfish samples were tested for red tide toxin. A total of 606 shellfish samples were collected and analyzed in 2009.

Every time a shellfish growing area undergoes a change in either an NSSP classification or in an "Open" or "Closed" status for areas classified as "Approved," "Conditionally Approved," "Restricted" or "Conditionally Restricted," a legal notice is required by *Marine Fisheries*. These notices reflect the type of opening or closure, the dates, the reason and other pertinent descriptive information and are sent to municipal managers, the state Office of Law Enforcement, the Department of Public Health (DPH), FDA and other interested parties. In 2009, 356 legal notices were written.

During 2009, the Shellfish Program was involved in a number of initiatives designed to improve shellfish classifications. Some of these are ongoing and seven resulted in classification changes. In January of 2009, *Marine Fisheries* reclassified 167 acres in Polpis Harbor, Nantucket (NT 4) to "Approved" after being partially seasonally restricted from 1995 and completely seasonally restricted to shellfish harvesting from 2003. Under the new classification resulting from water quality improvements based largely on septic system upgrades, the harbor will be open to shellfishing year around. A 43 acre area in Sandwich Harbor (CCB 37) was reopened seasonally in April 2009 after being closed since 1988. This area will be open to recreational harvest from November 1 – June 30 as a result of sewerage system installation and storm water management upgrades. Another area, Sandwich Coastal (CCB 35), was upgraded from "Prohibited" to "Approved" due to improved water quality exiting from Sandwich Harbor. This opened 167 acres closed since 1994. Additional work in Yarmouth allowed *Marine Fisheries* to expand the 25-acre seasonal opening in Mill Creek (SC 28.5) by an extra month.

After a 25-year shellfishing prohibition in Swansea's Coles River (MHB 4.1) and a 40+ year closure of the lower Lees River (MHB 4.1 and 4.3), *Marine Fisheries* reclassified 746 acres of closed shellfish beds in the Towns of Swansea and Somerset. *Marine Fisheries* agreed to re-evaluate the closures in Swansea waters after a 2007 request from the Town's Board of Selectmen following septic system upgrades made under Title V – Septic Systems of the State Environmental Code. The Swansea Board of Health vigorously applied the code to system failures and at the time of real estate transfers. Assessment work began in February 2008 and included a full sanitary survey and analysis of wet and dry weather impacts on water quality. This involved sampling storm drains during and after rain events and determining the amount of rain that would trigger a closure and the time necessary for the water to return to NSSP open area standards. Over 270 water samples were collected and analyzed over 16 months. Another 250 water samples collected prior to the sanitary survey were also used to assist in the determination. Each area opens annually beginning May 1 and closes on December 1 provided no more than 0.3 inches of rain falls in any 24 hour period. During 2009, the Town of Swansea sold over 550 commercial and recreational licenses. The opening of the shellfish beds in Swansea was a true cooperative effort by the town and *Marine Fisheries*. The Shellfish Program continues to monitor the shellfish beds as required by the NSSP and is working to determine if additional areas may be opened or if the seasonal open period can be expanded.

Another ongoing initiative was the three year re-evaluation and reclassification of Essex Bay (N 7) that was completed in early January of 2010 based on work begun in 2007. This will expand shellfish harvesting days by about 40% in Essex, Gloucester and Ipswich by raising the rainfall threshold in a 24 hour period that would cause a closure. This change affects 450 licensed commercial clambers and nearly 1,000 recreational harvesters in 1,900 acres of shellfish flats. In addition, another 459 acres became seasonally approved and will remain open in the winter except when rainfall exceeds three inches.

Other work on the North Shore that is ongoing has involved water quality studies in coastal areas in Rockport and Nantasket Beach in Hull, and a rainfall re-evaluation of Plum Island Sound (N 4), the Ipswich River, and Joppa Flats, Newburyport in the Merrimack River.

As a result of this work, 3,507 acres of shellfish area in eight communities have been upwardly reclassified; the availability of 2,092 acres was increased and 1,415 acres were made available for the first time in decades.

As a result of FDA and ISSC concerns about the naturally occurring pathogen *Vibrio parahaemolyticus* associated with raw oysters in the summer months, a water temperature monitoring program using automatic temperature recorders was initiated in 2008 and

continued in 2009. Monitors were located at eight sites and other data are being obtained from additional sources such as towns and Barnstable County. Temperature data will be used to annually assess the need for more stringent time-to-refrigeration requirements for the harvest of oysters during warm weather as required by the NSSP, or the need to monitor shellfish for vibrios. To date, average water temperatures have remained below threshold levels.

Program biologists also comment and make recommendations regarding U.S. Environmental Protection Agency National Pollution Discharge Elimination Permits. In 2009, 13 permits including four municipal waste water treatment plants required review and comment because of impacts to shellfish growing waters. Recommendations usually involve end-of-pipe fecal coliform bacteria standards and chlorination.

PSP Monitoring

Another major aspect of the shellfish program is monitoring for naturally occurring marine biotoxins produced by microscopic algae that can cause paralytic shellfish poisoning (PSP) or red tides. Consumption of shellfish containing certain levels of PSP toxin can cause severe illness and even death. Shellfish Program personnel collect shellfish from 15 primary stations weekly from March through mid-November. Samples are sent to the *Marine Fisheries* Gloucester lab where bioassays determine the levels of toxin in shellfish. 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.

The 2009 PSP season began in mid-March and started out with the typical annual closures in the Nauset Estuarine System in Orleans and Eastham. This event is considered a separate local occurrence and unrelated to the larger Gulf of Maine blooms. The initial closure was in Roberts Cove and portions of Nauset Harbor on April 17, 2009 to blue mussels only. By May 6, 2009, the entire system (Areas OC 2 – OC 6) was closed to all shellfishing and remained closed until harvesting of all bivalve shellfish was reopened on June 17, 2009 with the exception of Salt Pond in Eastham that remained closed until July 23, 2008.

The first PSP closure on the North Shore occurred on May 22, 2009 with the restriction on harvesting of blue mussels, surf clams, whole sea scallops, and carnivorous snails in coastal waters from the New Hampshire line to Boston, areas N 1 – N 28 and areas MB 13 – 14; and the closure of areas N 7 – N 14 in Ipswich, Essex, Rockport, and Gloucester to all shellfish. These latter areas (N 7 – N 14) were quickly reopened to the harvesting of soft-shell clams and razor clams on May 29, 2009. By June 3, 2009, a closure to the taking of all shellfish was extended from Point Allerton in Hull to the north side of the mouth of the North River in Scituate. This South Shore area remained closed until September 3, 2009 as the bloom and shellfish toxicity persisted with erratic fluctuations through the summer. Harvest of carnivorous snails and whole scallops remained restricted into 2010. North Shore areas N 1 – N14 were reopened on August 22, 2009 to all shellfish except carnivorous snails, ocean quahogs and whole sea scallops. These restrictions also carried over into 2010 for the North Shore.

The 2009 bloom affected 24 coastal communities, eight of which have commercial shellfish harvesting, compared to 39 communities in 2008 with 29 being involved in commercial harvesting. The total acreage closed in Massachusetts waters in 2009 was approximately 297,318 acres compared to 777,842 acres in 2008, a difference of 480,524 acres (61%). The 2009 bloom was similar in duration to the 2008 bloom but not as intense in terms of toxicity levels or geographic extent (Figure 1). No areas in Cape Cod Bay, eastern Nantucket Sound, outer coastal Cape Cod, and east of Nantucket or inside Boston Harbor were affected as in 2008. Also, there were no new closures in adjacent federal waters in 2009. Also, closures impacting the lucrative commercial soft-shell clam fishery on the North Shore included only two areas Essex Bay (N 7) and Annisquam River (N 9) and only lasted 6 days. This contrasts with 2008 when all major North Shore soft-shell clam areas were closed for over a month.

A total of 573 shellfish samples were collected and tested for PSP during 2009. The samples support two activities: monitoring in state waters (541 samples) and some sampling in adjacent federal waters including a pilot dockside monitoring program testing the efficacy of a sampling

protocol to safely harvest surf clams from closed areas of Georges Bank (32 surf clam samples). This is down 32% from the 837 samples processed in 2008 reflecting the lower toxicity and significantly reduced extent of the 2009 bloom. In addition, during this same time period, 228 phytoplankton samples were collected and analyzed (180 South Shore and 48 North Shore). This type of monitoring is based on relative abundance of phytoplankton using plankton nets and field microscopes and is directed at identifying the organisms that produce various biotoxins that cause PSP, Diarrhetic Shellfish Poisoning (DSP), and Amnesic Shellfish Poisoning (ASP). Shellfish staff investigated several blooms that produced large patches of red water in the upper parts of Buzzards Bay and Nantucket Harbor in August and early September caused by the non toxic phytoplankton *Cochlodinium sp.*

During 2009, there were no reported illnesses due to red tide in Massachusetts or attributed to Massachusetts shellfish in interstate commerce.

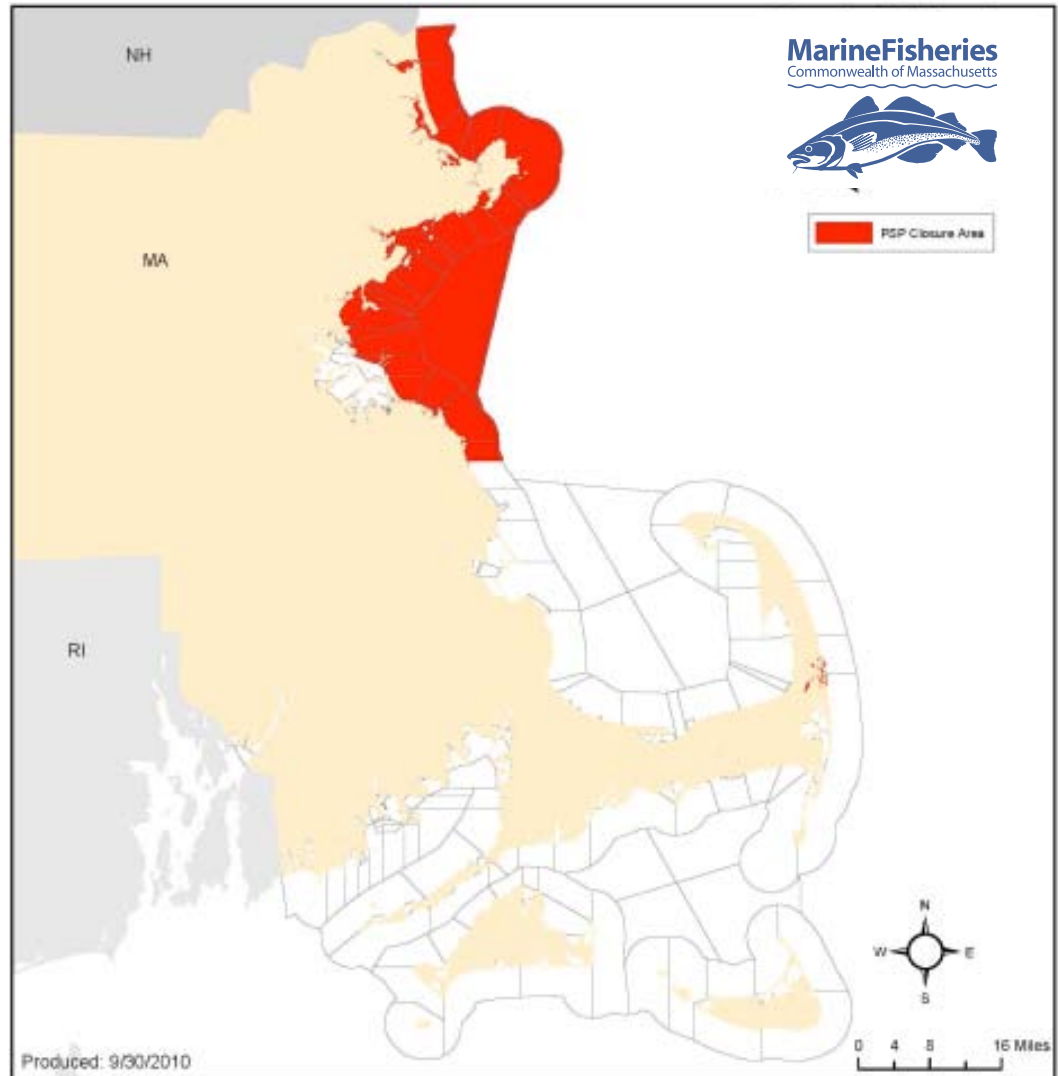


Figure 1. Map of PSP – closed areas off Massachusetts.

Contaminated Shellfish Resources

Marine Fisheries directly manages the contaminated shellfish resources for depuration, relaying, and bait.

Contaminated Relaying: *Marine Fisheries* permits municipalities to relocate bacterially contaminated shellfish to clean waters for natural purification and propagation. Relays are conducted under stringent NSSP guidelines and are heavily supervised by state and local enforcement authorities. Contaminated shellfish must remain at the relay site for a minimum of three months and also for the duration of one spawning season. Shellfish are tested prior to relaying and again before harvesting for human consumption. Quahogs are most often transplanted, but oysters and soft-shell clams are also moved. In past years, up to 14 – 18,000 bushels of quahogs have been moved annually from the Taunton River-Mount Hope Bay estuary, Fairhaven, New Bedford, and Dartmouth. In 2009, thirteen towns participated in the program transplanting a total of 6,706 bushels of quahogs (6,546 from the Taunton River, 153 from the Bumps River in Barnstable and seven from Allen's Harbor in Harwich) and 222 bushels of oysters (122 from North Bay, in Barnstable and 110 from the Pocasset River in Bourne) under 15 Contaminated Relay Permits. Shellfish were transplanted to 19 locations. This method of shellfish propagation affords participating municipalities a relatively inexpensive source of shellfish to use as parent stock and reduces the temptation of illegal harvesting by removing the stock from contaminated areas. Despite the benefits, the amount of shellfish being relayed has decreased in recent years due mostly to reductions in municipal shellfish department budgets and not from the lack of available shellfish stock or interest in relaying.

Contaminated Bait: Currently, the only contaminated shellfishery for bait is the heavily regulated, occasional surf clam fishery. Activity in 2009 was limited to landings of 1,094 bushels from prohibited areas of Nantasket Beach in Hull conducted by two dredge boats and one hand raker.

Depuration Process: The management and oversight of mildly contaminated soft-shelled clams, *Mya arenaria*, is a substantial activity for *Marine Fisheries*. Clams are harvested from specially designated, "Conditionally Restricted" areas in Boston Harbor, Pines River and the Merrimack River and transported by *Marine Fisheries* licensed and bonded Master Diggers under strict enforcement to the Shellfish Purification Plant located on Plum Island in Newburyport. Once at the plant, the clams are treated in a controlled aquatic environment and purified. The Shellfish Purification Plant is a state of the art facility containing nine depuration raceways. Pure seawater is obtained from two deep, salt water wells and is continuously disinfected using ultraviolet light. Depuration is a complex biological process requiring constant validation, during and upon completion of the treatment, through testing of shellfish and tank water. This is accomplished by daily testing in an on-site certified laboratory. The depuration process occurs for a minimum of three days and upon completion, the clams are returned to the harvesters, who pay a depuration fee. The purified clams are sold in commerce.

The plant received shellfish on a total of 178 days (runs) from 34 areas. A total of 14,993 racks (50 lb. bushels) of soft-shelled clams were received. Occasionally, the depuration process is not successful and the clams must be discarded. One lot harvested on September 4, from GBH5.5 Snake Island in Winthrop was seized after it failed to meet end-product release criteria with counts of 5,210 and 3,724 fc/100g meat. There were no recalls. The 14,993 racks, processed and released, generated \$89,958 in rack fee revenue.

Production came from greater Boston Harbor, the Pines River and the Merrimack River. Except for the Merrimack River, all harvesting was divided between three digging groups; Boston diggers (digging Boston, Revere, Saugus, and Winthrop), Quincy diggers, and South Shore diggers (digging Hingham, Hull, and Weymouth).

Table 2 provides plant production statistics by municipality, including the number and percent of days of shellfish delivery, the number and percent of racks of shellfish delivered, and the

average number of racks delivered per day. As can be seen from a comparison of the percent of days vs. percent of racks, Revere/Saugus, Boston, and Winthrop were the most productive communities delivering clams to the Purification Plant. This could be due to better areas (more clams), more diggers, better diggers, or some combination.

Table 1. Plant Production by Municipality.

City/Town	Days	Racks	Average/Day	% of Racks	% of Days
Boston	27	1,312	49	9%	5%
Hingham	60	1,230	21	8%	11%
Hull	47	903	19	6%	9%
Quincy	155	2,384	15	16%	29%
Weymouth	51	941	18	6%	10%
Winthrop	69	3,079	45	21%	13%
Newburyport	41	481	12	3%	8%
Revere-Saugus	77	4,663	61	31%	15%
Total	527	14,993			

By digging group, the Boston diggers accounted for 60% of all shellfish processed by the plant (up from 54% in 2008), followed by the South Shore diggers (21%; down from 23% in 2008), the Quincy diggers (16%; down from 18% in 2008), and the Newburyport diggers (3%; down from 4% in 2008) (Table 2). The Boston digging group also harvested the most number of tides, 173 of a possible 178 runs. Newburyport and the Merrimack River areas were harvested the least by any digging group with only 41 harvested tides due to a more restrictive rainfall closure policy than Boston Harbor and a lack of Master and Subordinate diggers. By waterbody, twice as many clams were harvested in Boston Harbor (66%) as the Pines River (31%), followed by the Merrimack River (3%) (Table 3).

Table 2. Plant Production by Digging Group.

Digging Group	Days	Racks	% Racks
Boston	173	9,054	60%
Quincy	155	2,384	16%
South Shore	158	3,074	21%
Newburyport	41	481	3%
Total	527	14,993	

Table 3. Plant Production by Waterbody.

Waterbody	Racks	% Racks
Boston Harbor	9,849	66%
Merrimack River	481	3%
Pines River	4,663	31%
Total	14,993	

Table 4 breaks down harvest by individual area. Once again, N26.1 in Revere/Saugus had the highest production, supplying 31% of all clams to the plant. The next most productive area was the Airport in Winthrop GBH5.2 with almost 14% of the harvest, then Wood Island Flat at 6% followed closely by Hingham Harbor GBH1.8 with 5.2%. N26.1 was harvested on 77 days, the Airport on 46 days, Merrimack River on 41 days, and Hingham Harbor was harvested 36 times.

Table 4. Plant Production by Shellfish Classification Area.

City/Town	Area	Days Dug	Racks	Average/Day	%
Boston	GBH 5.4	17	893	53	6.0%
Boston	GBH 3.9	7	283	40	1.9%
Boston	GBH 3.10	1	51	51	0.3%
Boston	GBH 3.6	1	45	45	0.3%
Boston	GBH 5.3	1	40	40	0.3%
Hingham	GBH 1.8	36	783	22	5.2%
Hingham	GBH 1.7	8	168	21	1.1%
Hingham	GBH 1.11	8	136	17	0.9%
Hingham	GBH 1.14	7	129	18	0.9%
Hingham	GBH 1.9	1	14	14	0.1%
Hull	GBH 1.2	19	399	21	2.7%
Hull	GBH 1.3	17	292	17	1.9%
Hull	GBH 1.5	8	167	21	1.1%
Hull	GBH 1.1	2	39	20	0.3%
Hull	GBH 1.4	1	6	6	0.0%
Newburyport	N 2.1	41	481	12	3%
Quincy	GBH 1.23	33	642	19	4.3%
Quincy	GBH 3.2	31	601	19	4.0%
Quincy	GBH 2.4	24	331	14	2.2%
Quincy	GBH 1.25	17	224	13	1.5%
Quincy	GBH 1.26	17	216	13	1.4%
Quincy	GBH 2.5	18	186	10	1.2%
Quincy	GBH 2.1	13	170	13	1.1%
Quincy	GBH 2.2	1	8	8	0.1%
Quincy	GBH 1.27	1	6	6	0.0%
Revere-Saugus	N 26.1	77	4663	61	31%
Weymouth	GBH 1.21	16	510	32	3.4%
Weymouth	GBH 1.10	13	159	12	1.1%
Weymouth	GBH 1.13	10	122	12	0.8%
Weymouth	GBH 1.29	10	120	12	0.8%
Weymouth	GBH 1.20	2	30	15	0.2%
Winthrop	GBH 5.2	46	2055	45	13.7%
Winthrop	GBH 5.5	15	736	49	4.9%
Winthrop	GBH 5.1	8	288	36	1.9%
Total Areas	34				
Total Racks			14,993		
Total Lot-Areas		527			
Total Runs		178			

Shellfish Plant Laboratory: The plant received shellfish on 178 days (runs) and processed 527 lots of shellfish. In total, the lab processed 1,191 shellfish samples, 100 (9%) more than 2008, and 1,333 water samples, 136 (11%) more than calendar year 2008. Table 5 lists the number of samples analyzed at each stage of treatment and the total number of each type of water sample analyzed.

Table 5. Lab Statistics.

Shellfish Samples Processed		Water Samples Processed		
Depuration Stage	ETPC		MF	MPN
Zero	245	Seawater	281	
Mid 1	289	Tap water	281	
Mid 2	556	Effluents	768	3
Mid 3	35	Totals/Test	1330	3
End Product	66	Combined	1333	
Totals/Test	1,191			

The geometric mean of all zero hour/raw shellstock product samples coming in to the plant was 104 fc/100g (fecal coliform per 100g clam meat). The average Mid1 treated sample was 38 fc/100g and Mid2 sample was 24 fc/100g (Table 6). Once again this year, the plant exceeded NSSP release criteria requirements with a geometric mean (GM) of 23 fc/100g for all released shellfish. The highest incoming counts were "TNTC" (too numerous to count), on September 12 from GBH1.8 Hingham Harbor, and on October 9 from GBH1.2 in Hull. Thirty-one percent (65 of 209) of zero hour lots exceeded the 230 fc/100g market standard, yet only 4% (21 of 526) of Mid 2 samples exceeded the market standard and required additional treatment.

Table 6. Lab Results.

Depuration Stage	fc/100g (GM)
Zero	104
Mid 1	38
all Mid 2	24
Released Mid 2	21
all Mid 3	72
Released Mid 3	48
All End Product	38
All Released Shellfish	23

Boston Harbor Soft-Shell Clam Enhancement

The Boston Harbor Shellfish Stock Enhancement Project is restoring/enhancing soft-shell clam populations in five Boston Harbor communities: Winthrop, Quincy, Weymouth, Hingham, and Hull. Restoration is being conducted through cooperative programs with local municipalities, commercial shellfish harvesters, and Salem State Northeast Massachusetts Aquaculture Center (NEMAC), with funding and technical assistance from *Marine Fisheries*. Preliminary work was conducted in 2006, when the restoration team seeded over one million hatchery-reared juvenile clams within five enhancement sites on tidal flats in Quincy, Weymouth and Hingham. Clam size, sediment type and beach kinetics were found to significantly influence clam survival. Planted clams larger than 10mm in length exhibited a higher survival rate than smaller juveniles. Smaller juvenile clams that were planted in silty mud did not survive. Similarly, enhancement sites that were exposed to significant tidal current, stream flows, wind driven waves or vessel wake suffered high levels of clam mortality. During 2007 and 2008, an additional 1.7 million juvenile clams (10.5–17 mm) were stocked at 12 enhancement sites in Hull, Winthrop, Quincy, Weymouth, and Hingham. During the 2009 season, approximately 1.75 million seed clams that

averaged between 11 and 13 mm in shell length were stocked within 103 plots at six Boston Harbor enhancement sites. By December 2009, nearly 4.5 million juvenile soft-shell clams were planted within 23 enhancement sites throughout the five participating Boston Harbor coastal communities.

During the three years following the 2006 pilot study, larger juvenile clams (10-15 mm) were planted in more suitable habitats and the restoration team has sampled the sites for clam growth and survival. Although clam growth varied between sites, within 1 ½ years of growth, between 50% and 75% of the planted clams grew to the legal size of two inches (50.8 mm). By year two, virtually all of the planted clams grew to legal size. Because soft-shell clams reach sexual maturity at a shell length of approximately 35 mm, *Marine Fisheries* growth data suggests that a portion of the planted clams spawn during the late summer of the following year, and that most if not all of the clams spawn during the spring and summer of their second year. It is hoped that clams planted within the restoration sites successfully spawn over the course of two to three years, thus replenishing the clam beds within nearby tidal flats.

Periodic estimates of clam density within restoration plots are a useful tool in gauging the general success of seeding efforts within enhancement sites over time. Density of surviving planted clams is difficult to accurately measure given their natural contagious (clumped) distribution on the tidal flats. Following 14–16 months of growth, clam densities within the 49 restoration plots seeded in 2007 were generally classified as “High” (> 25 clams/ft²), “Medium” (15-25 clams/ft²) and “Low” (1-15 clams/ft²). Sixty-eight (68) percent of the plots contained High clam densities, 18 % contained Medium densities, and 14 % contained Low densities.

Survival of planted shellfish is probably the most important parameter that restoration teams need to assess in order to gauge the success and impact of a particular program on shellfish resources within the targeted area. In order to obtain accurate survival estimates of clams planted in Boston Harbor, the restoration team carried out controlled harvests of one restoration plot seeded in 2006 and six restoration plots seeded in 2007. The controlled harvests consisted of commercial fishermen harvesting all clams within a restoration plot. Harvested clams were divided into legal or sublegal categories and counted. Representative samples of clams within each harvested plot were also collected for measurement of shell length.

Clam survival within three of the restoration plots were markedly lower than anticipated, ranging between 0.4 and 7.3 percent. The low survival rates in these cases are attributed to the plots being compromised by alleged unauthorized clam digging. The percentage of clams that survived 2+ years within the remaining four intact restoration plots ranged between 13.5 and 31.3 percent survival.

To better understand the influence that acidification might have on soft shell clam stocks within Greater Boston Harbor, monitoring of sediment pH began within the 103 plots that were deployed at six restoration sites throughout Boston Harbor in 2009. With the establishment of a baseline data set of sediment pH levels at the 2009 enhancement sites, an effort will be made to relate clam growth, survival and recruitment to pH sediment levels over the course of the next several years. During the winter of 2009/2010, sediment pH was measured and documented within all 103 restoration plots that were seeded in 2009. Measurements of pH taken from the center of each plot varied widely, with surface values ranging between 6.65 and 7.69 and sub-surface (30 cm depth) values ranging between 6.50 and 8.15. It is possible that some of the observed pH levels are low (acidic) enough to adversely impact clam recruitment and possibly clam growth and survival. More work is planned during 2010 to test this hypothesis.

Surf Clam and Quahog Dredge Fisheries

Table 7 lists the 2009 vs. 2008 fishery statistics for surf clam and quahog fisheries. Surf clam landings increased in 2009 with the participation of 5 additional vessels. Landings of northern quahogs increased significantly despite similar vessel participation between years (Table 7).

A total of 29,865 pounds or 363 bushels of ocean quahogs valued at \$587.00 was landed by one dredge boat in 2009. No landings of ocean quahogs were reported in 2008.

Table 7. Surf Clam and Quahog Dredge Fishery Statistics.

	Year	Number of Vessels	Number of Lbs.	Number of Bushels	Value
Surf Clams	2009	19	7,998,332	89,768	\$1,715,633
	2008	14	7,359,032	81,767	\$1,512,689
Northern Quahogs	2009	16	2,718,520	36,247	
	2008	15	1,684,572	24,065	

Technical Assistance Project

In Massachusetts, the cities and towns manage the shellfisheries in all waters within their boundaries that are not closed by *Marine Fisheries* for public health reasons, with the exception of commercial harvest of surf clams and ocean quahogs that remain under state control. The Shellfish Program assists municipalities concerning a wide variety of shellfisheries management issues by providing technical and regulatory information as well as recommendations to local shellfish managers. Assistance is furnished regarding shellfish propagation techniques, predator controls, shellfish survey methods, management openings and closures, habitat improvements, shellfish management plans, aquaculture development and regulation, water quality, sanitation and public health and permitting. Each shellfish biologist and the program supervisor provide technical assistance to municipal managers and boards, state and federal agencies, academia and non-governmental research and management organizations, and individuals. It is estimated that throughout the year, staff rendered technical assistance on over 4,000 separate occasions to more than 2,000 entities.

Environmental Protection Project

Shellfish Program personnel respond to pollution events in coastal waters in order to assess possible damage to shellfish resources and to determine the need for public health closures. In 2009, these events included sewage discharges (6), boat sinkings (1), petrochemical spills (9), and other discharges of hazardous chemicals. None of the 2009 events were of any long term serious consequence, but did result in temporary shellfish closures when not already in a closed area.

In addition, the Shellfish Program co-reviews with other *Marine Fisheries* staff various proposed coastal alteration projects with regard to impacts on water quality, shellfish resources and shellfish habitat. Recommendations are made through the *Marine Fisheries* environmental review process to the permitting agencies concerning the effects of proposed structures, filling or discharges into the marine environment. In 2009, approximately 428 proposed projects in 49 communities were sent to the Shellfish Program for some level of review and comment. Staff reviewed projects ranging in size from private docks to large projects such as the Weaver Cove LNG terminal in Fall River, the Cape Wind proposal in Nantucket Sound and runway safety area improvements at Logan Airport in Boston.

Aquaculture Management Project

A major management and technical assistance endeavor of the Shellfish Program is the regulation of shellfish aquaculture. 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 MGL Chapter 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 2009, 30 new private aquaculture license sites in nine towns totaling 146.5 acres were surveyed and the sites approved. In addition, aquaculture permits (a.k.a. propagation permits) were issued to 306 license site holders operating shellfish aquaculture projects on 382 sites totaling 960 acres in 26 coastal towns. The 2008 value of shellfish marketed by growers, as reported in 2009, was \$7,316,782.00 based on average wholesale price. This is an increase of \$1,135,782.00 over 2007. Reported production in bushels for 2008 was: quahogs 27,461; oysters 49,381; soft shell clams 2,484; and bay scallops 8,218. Other related activities include: assisting individuals in the licensing and permitting process, providing information on aquaculture to interested parties, assisting municipalities with site selection prior to formal site survey in order to avoid *Marine Fisheries* denial, and assisting growers in finding seed sources and working with hatcheries to become certified to sell seed in Massachusetts. Annually, an aquaculture report is prepared describing marine aquaculture activities. A list of approved shellfish hatcheries is maintained on the *Marine Fisheries* website.

Other Activities



The Shellfish Program continues to participate in the activities of the ISSC, the primary agency involved in setting standards for the NSSP that regulates shellfish sanitation. The Project Supervisor, J. Michael Hickey, is Chairman of the Executive Board and also chairs or is a member of six committees including chair of the *Vibrio* Management Committee. He was responsible for coordinating activities at the weeklong Biennial Meeting held in Manchester, New Hampshire in October 2009. This meeting was attended by over 300 people from nine countries.

Program staff participates in professional organizations such as the Northeast Shellfish Sanitation Association, the Massachusetts Shellfish Officers Association, and the New England Estuarine Research Society. In addition, the laboratory staff participates in training and workshops of the Northeast Laboratory Evaluation Officers and Managers funded by FDA.

Susan Boehler is the only U.S. FDA certified Laboratory Evaluation Officer in Massachusetts with responsibility for evaluating all laboratories involved in bacteriological analysis of water or shellfish acceptable to the NSSP and ISSC. This involves two *Marine Fisheries* labs, one Massachusetts Water Resources Authority, a City of New Bedford lab, and a single industry lab.

Program Chief Hickey is a member of the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Shellfish Transport Committee (ISTC) that has recently been involved in a review of an Environmental Impact Statement concerning a proposal to introduce the Asian oyster, *Crassostera ariakensis* into Chesapeake Bay. ASMFC recommended against the planned introduction.

During 2008 and 2009, the *Marine Fisheries* shellfish habitat maps were updated. Shellfish staff initiated the update of Shellfish Classification Maps with the assistance of Fishery Analyst Julian Race.

Program staff, principally Neil Churchill, and the Program Chief participate in periodic meetings with the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, and the Department of Environmental Protection relative to oil and hazardous materials spill contingency planning and drills. This involves membership on two Area Committees developing Area Contingency Plans and state Geographic Response Plans for oil and hazardous substance discharges in both Massachusetts Coast Guard Sectors.

Habitat Program

Personnel:

Dr. Kathryn Ford, Program Leader
Tay Evans, Marine Fisheries Biologist
Eileen Feeney, Marine Fisheries Biologist
Frank Germano, Senior Marine Fisheries Biologist (retired)
Vin Malkoski, Senior Marine Fisheries Biologist
Mark Rousseau, Marine Fisheries Biologist
Steve Voss, Fisheries Technician

Overview:

The *Marine Fisheries* Habitat Program is focused on comprehensively understanding and assessing impacts to marine fisheries habitat. Its purposes are to provide science-based technical review of coastal and marine alteration projects; to initiate and perform fisheries habitat research and applied studies; and to provide technical guidance on both the status of, and potential impacts to fisheries resources and habitats of the Commonwealth. The Habitat Program provides invaluable input to the marine alteration project review process resulting in significant technical guidance to other agencies and jurisdictions in evaluating potential impacts from proposed construction projects.

In 2009, 633 projects were reviewed, including posting of 83 shellfish sanitary surveys on the agency's internal web site, drafting of a geodatabase with all marine resource information for Cape Cod embayments, updating of the time of year recommendations, drafting of a data needs document, initiation of the in lieu fee mitigation program, and continuation of project leader meetings in Gloucester and New Bedford. The Habitat Program co-authored the baseline assessment for the Massachusetts Ocean Plan and participated actively in several Ocean Plan committees, workshops, and meetings.

Technical Review Project

The goal of the Technical Review Project is to protect and enhance marine fisheries resources by providing information regarding those resources to regulatory agencies during coastal alteration permit review and tracking mitigation projects and needs. To meet this goal, the *Technical Review* team tracks coastal and marine construction projects, solicits specific resource information from *Marine Fisheries* biologists, writes project comment letters, reviews options for compensatory mitigation and participates in interagency meetings. Technical Review also creates programmatic approaches to resource recommendations, improves access to coastal resource information, and supports research specific to review needs. The Technical Guidance Project was subsumed under Technical Review this year, since the two projects had such interrelated goals. The major tasks are:

Technical Review

This project continues to respond to a high volume of requests for technical review for specific construction permits as well as for general state needs (e.g., mosquito ditching in salt marshes); 633 specific projects were reviewed. We rely heavily on the expertise and support from almost all *Marine Fisheries* staff. Management and prioritization of the volume of requests is of primary importance.

Major review projects, including Weaver's Cove LNG Terminal, HubLine Mitigation Requirements, Logan Airport runway improvements, Programmatic Permits for the Army Corps and MassHighways, and large port projects in the Merrimack River, Salem Port, and the Danvers River took significant amounts of time to review. They all involved multiple meetings, workgroups, and interagency communications due to the complexities of the proposals.

Time of Year Work Windows

Two major projects were released in draft form this year. The first was a comprehensive update of our "time-of-year" recommendations for construction. This report includes robust, literature-supported explanations of how the recommendations are established and involved consultations with many experts both within and external to *Marine Fisheries*. The second project involved creating a programmatic "time-of-year" recommendation for the Barnstable County Dredge Project. This project involved creating a habitat map for all Cape Cod embayments, linking dredge locations with resource information. Both of these projects were discussed at length with other resource agencies and town representatives.

Standard Protocols

This year the Technical Review team started assembling a wide variety of information to create a Review Manual. The goal is to achieve improved consistency with our review of projects, create a framework that applicants can use to anticipate project design requirements, and provide an orientation for the new hire anticipated in 2010. A component of this larger vision was a comprehensive document describing the data needs associated with assessment of impacts on marine fisheries resources. A draft entitled: "Essential data for assessing biological impacts to fisheries resources and habitats from construction activity" is currently under review within the project, and is anticipated to be published in the Technical Report Series.

In Lieu Fee Program

This was the first full year of the *Marine Fisheries* and Army Corps of Engineers In Lieu Fee Program. This program provides a mechanism for mitigation requirements associated with impacts smaller than one acre in extent. The program required general oversight this year, with particular attention on program administration. A mitigation guidance document was created for reviewers to determine which projects are eligible for mitigation. Fees will be expended in future years as the program becomes fully operational.

Fisheries Habitat Research Project

The goal of the Fisheries Habitat Research Project is to conduct research, monitoring, and restoration relevant to the mapping, identification, and quality of marine fisheries habitats. This program also aids in the creation of new data products now viewed as necessary in the fisheries management community (e.g., seafloor maps; Figure 1).

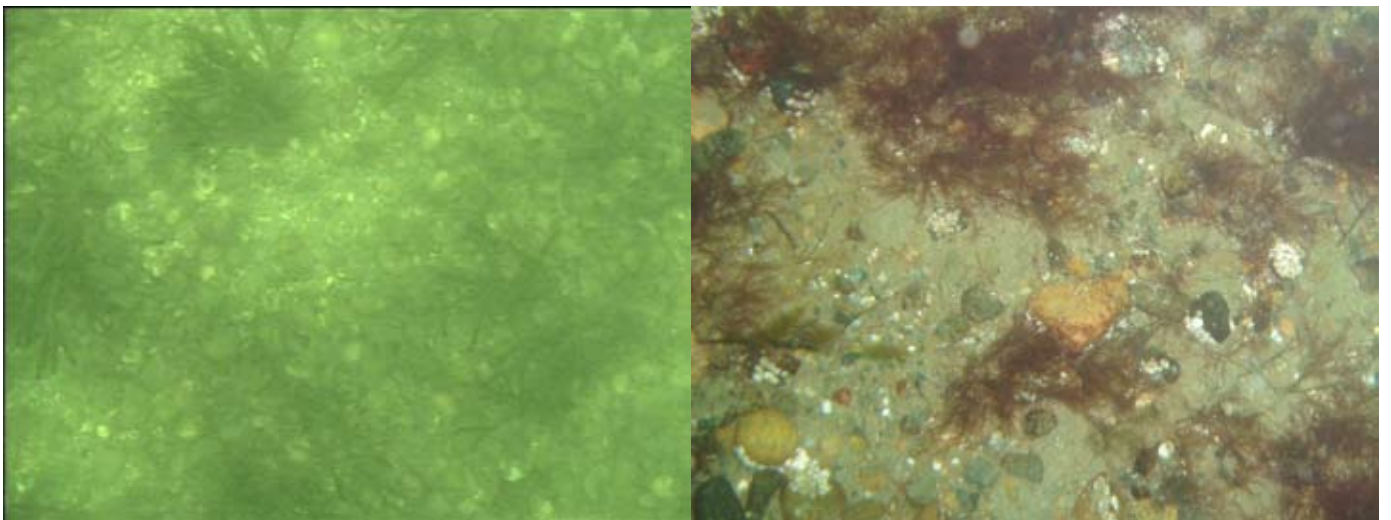


Figure 1. *Marine Fisheries'* personnel prepare for deployment of a frame-mounted video camera for seafloor imaging on the R/V *Mya*; *Marine Fisheries'* also has multibeam instrumentation mounted on the Focus-2 towed underwater vehicle and bow-mounted on NOAA's 72' R/V *Gloria Michelle* for midwater and seafloor backscatter characterization.

Sediment Geodatabase

As part of the Ocean Management Plan, the Habitat Research team compiled multiple datasets with sediment point data and created a method to assess the overall quality of the data state-wide. This dataset is currently being analyzed for publication in the *Marine Fisheries* technical report series. This dataset was combined with landscape analyses to map seafloor types state-wide, and a paper is being prepared for submittal into the peer-reviewed literature in collaboration with Coastal Zone Management. This group also contributed substantively to discussions about the value of complex seafloor features.

PCB Sampling

Poly-chlorinated biphenyl (PCB) sampling in marine biota off New Bedford was conducted according to pre-established protocols of the federal Environmental Protection Agency and Massachusetts Department of Environmental Protection. Reports were submitted as required.

Eelgrass

There are several eelgrass initiatives that the Habitat Research team is undertaking:

1. SeagrassNet monitoring at an eelgrass bed in Salem Sound continued quarterly. This project involves the use of divers to regularly collect data to assess regional changes in seagrass health according to international protocols. This project is in its second year and is supported by the DMF dive team.
2. *Marine Fisheries* started coordinating the Massachusetts Seagrass Task Force this year. This network is designed to maintain and improve communications across researchers and managers involved with seagrass. The network has had two phone conferences.
3. *Marine Fisheries* is a partner on a recently awarded National Oceanic and Atmospheric Administration grant to conduct research on the effectiveness of conservation moorings in minimizing anchor scour in eelgrass beds.
4. Mitigation funds associated with eelgrass loss caused by HubLine were awarded to *Marine Fisheries* for the restoration of 1.8 acres of eelgrass at three potential sites in Beverly and Boston Harbor.
5. A paper detailing the success of the first HubLine eelgrass restoration project was accepted for publication in *Estuaries and Coasts*.
6. Standard protocols for eelgrass restoration and monitoring were completed and posted on the website.

Artificial Reefs

A site assessment survey was completed for a potential artificial reef project in Harwich. Sidescan sonar, underwater video, and diver transects were utilized to characterize an existing artificial reef site and a proposed site that was identified by screening existing data sources. The final report for the project is anticipated in the spring of 2010 in conjunction with a presentation to involved stakeholders. Field support was provided in the monitoring of the artificial reef constructed off Boston as a component of the HubLine restoration program.

Improving Access to Shellfish Data

In an effort to improve access to *Marine Fisheries'* archived and current shellfish data, we started posting shellfish sanitary surveys on the agency's intranet. The sanitary surveys provide current status and, in many cases, history of every waterbody in Massachusetts. Previously, surveys were only available in hard-copy form. As of December 2009, 83 of the files were posted, including all existing digital files. An additional 200 surveys were scanned and posted in early 2010 which completed the task. The Habitat Project also helped to establish the framework for mapping aquaculture leases in a digital geodatabase.

Other Activities

Climate Change

The Climate Change project was created this year with the goal of establishing a coherent approach to examining issues surrounding climate change within *Marine Fisheries*. This project is one component of an overall focus of the Massachusetts Department of Fish and Game to evaluate how climate change considerations should be integrated into fisheries and wildlife management. This past year, the Climate Change project represented *Marine Fisheries* on the Executive Office's Climate Change Task Force, providing recommendations to the state regarding potential impacts and adaptation strategies in the face of climate change. The project also created goals, objectives, and actions for the coming year. They are: 1) establishing a website to describe *Marine Fisheries* data that is relevant to climate change; 2) gaining expertise in climate change issues and representing the agency at climate-related meetings as needed; 3) identifying issues that are a priority for *Marine Fisheries* relevant to climate change; and 4) promoting research on those priorities.

Ocean Planning

There has been considerable focus on statewide and region-wide marine spatial planning in the last year. The Fisheries Habitat Program has provided support and information to sustainable ocean planning activities at both the state and regional level. This has included a second year of participation in the state Ocean Management Planning initiative. Meetings, workshops, and writing associated with the habitat and fisheries workgroups, baseline assessment, ecological valuation index subgroup, and interagency subgroup were completed. Habitat Program staff helped assemble data, write and review portions of the Final Baseline Assessment report.

Outreach

Fisheries Habitat Program staff continued its tradition of participating in a variety of outreach events. This participation included manning booths at Salem Sound Coastwatch Swim and Fin Event, the Massachusetts Association of Conservation Commissioners annual meeting, the Boston Sea Rovers annual meeting, and the Boston Boat Show. We also organized presentations at the Women in Science and Engineering event and gave presentations at local schools.

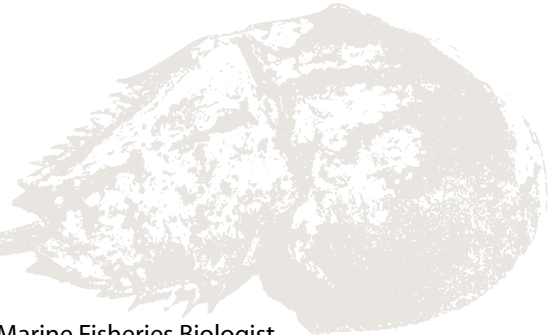


Invertebrate Fisheries Project

Personnel:

Robert Glenn, Program Leader
Tracy Pugh, Marine Fisheries Biologist
Alison Leschen, Marine Fisheries Biologist
Kelly Whitmore, Marine Fisheries Biologist
Steve Wilcox, Fisheries Technician
Derek Perry, Fisheries Technician
Beth Basinski, Seasonal Fisheries Technician

Additional Contributor: Bruce Estrella, Senior Marine Fisheries Biologist



Overview:

The Invertebrate Fisheries Project focuses on research and monitoring of American lobster, horseshoe crab, and northern shrimp to provide pertinent data to enhance management of these species. Monitoring projects for American lobster include commercial sea-sampling, the ventless trap survey, and early benthic phase lobster suction sampling. For horseshoe crabs, the spawning beach survey and other fisheries monitoring is conducted with volunteer groups and partnering agencies. For northern shrimp, we contributed to the assessment and trawl survey in the Gulf of Maine. Research grant writing and administering and participation in Atlantic States Marine Fisheries Commission (ASMFC) fisheries management and stock assessment meetings for key invertebrate species are ongoing tasks. Blue crab management and monitoring were also part of the Program in 2009.

Lobster Project

Commercial Lobster Trap Sampling

The 29th year of the Commercial Lobster Trap Sampling effort was completed. This is an ongoing cooperative effort conducted with Massachusetts commercial lobster fishermen dating back to 1981. A total of 86 trips were conducted in which 43,099 lobsters were sampled from 17,276 trap hauls. Data entry from all regions has been completed and data analysis is in progress.

Due to continuing concerns of Outer Cape Cod Lobster Management Area (OCCLMA) members regarding the new Federal v-notch definitions and maximum size rules, sea sampling with the Provincetown fleet continued in 2009, and will continue into the future. Additional data analyses related to these rule changes in Outer Cape Cod were conducted and a memo to the Director was prepared that summarized the impacts of the proposed rule changes (i.e., estimates of the percentage of the catch in number and weight that would be lost as a result of the proposed rule changes). Data from 2005 through 2008 were used in these analyses. See the link below for the complete document: http://www.mass.gov/dfwele/dmf/programsandprojects/2008_occ_vnotch_%20max_gauge_memo_final_030409.pdf

Data from the commercial trap sampling program were contributed to the ASMFC Lobster Technical Committee, the Atlantic Coastal Cooperative Statistics Program (ACCSP), and the bi-annual *Marine Fisheries* lobster status of the stock report.

Ventless Lobster Trap Survey

The fourth year of the Coastwide Ventless Trap Survey was completed within the territorial waters of Massachusetts using a random stratified survey design with depth as the strata classification. Sixty sampling stations in National Marine Fisheries Service (NMFS) Area 514 and 24 stations in NMFS Area 538 are randomly selected each year and are sampled twice monthly from June through September (Figure 1). This survey design allows biologists to develop more precise estimates of lobster relative abundance and to adequately characterize the size distribution of lobsters in coastal waters. In 2009, a total of 56 trips were completed by *Marine Fisheries* staff and more than 17,000 lobsters were sampled from 3,308 trap hauls. Data entry was completed and results of data analysis will be made available to the ASMFC Lobster Technical Committee.

The ventless trap survey is a multi-state cooperative effort between state fisheries agencies and commercial lobstermen and takes place using standardized sampling methods in coastal waters from Maine to New York.

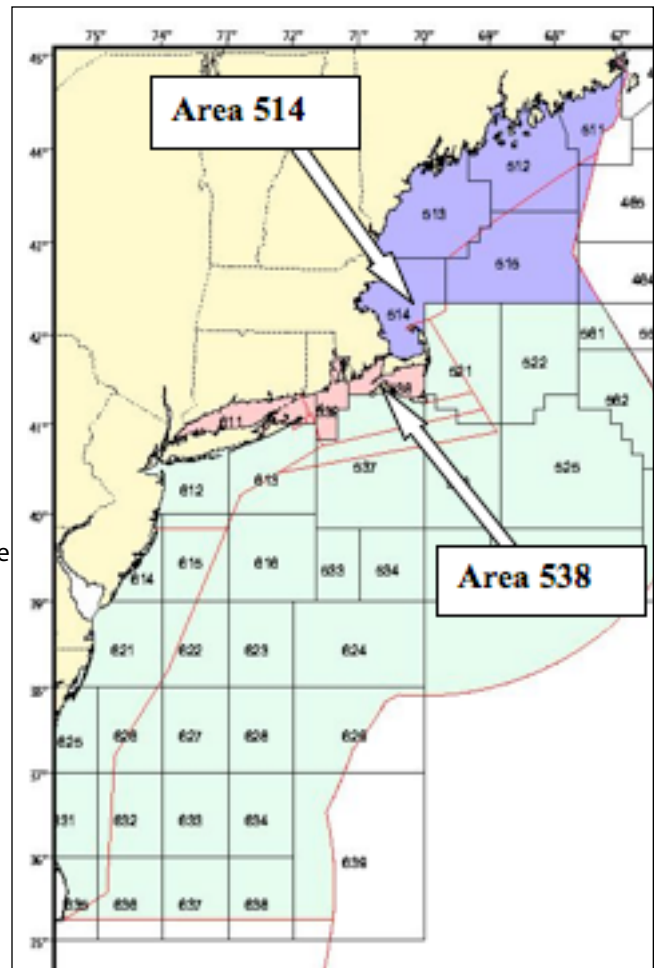


Figure 1. Map of NMFS statistical areas and the three lobster stock units (shaded areas) off of the Massachusetts coast.

Lobster Stock Assessment

Staff participated in multiple ASMFC Lobster Stock Assessment Subcommittee meetings to complete the 2009 ASMFC Lobster Stock Assessment. The final version of the stock assessment report was drafted and submitted to the ASMFC Lobster Management Board. The status of the lobster resource in U.S. territorial waters was mixed. The Gulf of Maine and Georges Bank stock are at high levels of abundance with moderate exploitation rates and are both characterized as being in “good” condition. The Southern New England stock is at record low levels of abundance with moderate to low exploitation rates and is characterized as being in “poor” condition. The decline in the Southern New England stock is being attributed to prolonged high levels of commercial exploitation in combination with increased natural mortality associated with changing habitat conditions, namely, increased temperature.

Annual Early-Benthic-Phase Lobster Suction Sampling

The 15th year of the Annual Early Benthic Phase (EBP) Lobster Suction Sampling Program was completed. The 17 coastal sites spanning Buzzards Bay, Cape Cod Bay, and Massachusetts Bay were surveyed over eight days from mid-August to mid-September. The 2009 survey yielded one of the lowest densities of young-of-the-year (YOY) lobsters on record. All regions were below their time-series means.

Annual Boston Harbor Artificial Reef Monitoring

The fourth year of annual sampling was completed on the *Marine Fisheries*-constructed HubLine artificial reef. Monitoring components included transect surveys and suction sampling on both the artificial reef and comparison natural reef sites. Transect surveys were conducted over three days in July using quadrat and swath bar sampling techniques. Results indicated that the natural reef remains more diverse than the cobble artificial reef; however, the cobble has provided habitat for a variety of life history phases of American lobster, other crustaceans, and finfish. We have found that there are differences in species' preferences for particular rock sizes, a finding that can be used in developing a framework for future mitigation efforts.

Lobster Settlement Dynamics in LMA 2

In early 2009, the Invertebrate Fisheries project initiated a Commercial Fisheries Research Foundation-funded study, entitled "Examining settlement dynamics of postlarval American lobster (*Homarus americanus*) in Lobster Management Area 2". This study was led by *Marine Fisheries* staff with participation from RI DEM, NMFS, Bigelow Laboratories, RI Lobstermen's Association, and MA Lobstermen's Association. For this multi-faceted study we set out 224 postlarval lobster settlement collectors (Figure 2) in coastal waters from Buzzards Bay to Block Island to determine geographic distribution of settlement in LMA 2. We also deployed 34 satellite-tracked drifters in upper and lower Buzzards Bay, Vineyard Sound, Rhode Island Sound, and Narragansett Bay to observe larval transport pathways. Total distance logged by drifters was over 16,000 kilometers and durations varied from a few hours to over 100 days. Air-lift sampling was conducted to evaluate habitat quality in areas receiving larval supply, as indicated by the drifter tracks. Field sampling was completed in October 2009 and report writing will commence in 2010.



Figure 2. Hauling back settlement collectors.

Lobster Reproduction Studies

Staff member T. Pugh has entered into a collaboration with the University of New Hampshire (UNH) to conduct research on lobster reproduction as part of her PhD dissertation. Working with UNH professor Dr. Wynn Watson, Ms. Pugh is conducting field and laboratory work that examines how male lobsters may be limited in their ability to contribute sperm to females, with the end goal being to account for male contributions to reproductive success in the stock assessment process.

As a component of this collaboration, a grant from the Commercial Fisheries Research Foundation was awarded to UNH (W. Watson, P.I., *Marine Fisheries* contributors R. Glenn and T. Pugh), for which T. Pugh is responsible for conducting data collection and analysis. The goal of the two-year grant, entitled "*The Buzzards Bay lobster resource: Are changes in reproduction having a negative impact on the fishery?*" is to determine if relatively recent changes in lobster reproduction dynamics have altered the reproductive potential of this valuable marine resource. Work includes at-sea sampling, tagging, and a review of existing long-term data sets.

Approximately 5,600 lobsters were observed during the 2009 sampling season, 1,942 of which were tagged and released. Five hundred forty-seven female lobsters were sampled to determine if they had mated successfully. Data analysis for this project is in progress.

Recreational Lobstering Guide

Staff developed the first ever *Massachusetts Recreational Lobstering and Crabbing Guide* [http://www.mass.gov/dfwele/dmf/publications/dmf_recreational_lobster_crab_guide.pdf]. This document is a comprehensive guide to recreational lobster and crab fishing in Massachusetts and includes information on regulations, gear, and lobster and edible crab biology. This guide will be printed in 2010 and distributed to constituents.

Scrubbing Investigations

Massachusetts Environmental Police (MEP) was assisted by B. Estrella on several occasions with a forensic evaluation of female lobster swimmerets to determine if eggs were forcibly removed. A publication by the United Kingdom's Eastern Sea Fisheries Joint Committee entitled: *Synopsis of Work Conducted to Develop A Test To Identify Lobsters (Homarus gammarus) That Have Had Their Eggs Scrubbed Illegally*, which represented a cooperative effort between B. Estrella, *Marine Fisheries*, and Duncan Vaughan of the UK Committee, was provided to MEP officers and the *Marine Fisheries* Lobster Project staff for use in future "scrubbing" investigations. The publication contains excellent color photos of stained lobster swimmerets from 3 categories: non-egg bearing females (non-scrubbed), egg-bearing females that hatched eggs naturally, and egg-bearing females that had been scrubbed. This publication encapsulates the successful effort made to have the scrubbing detection technique that is used in Massachusetts and elsewhere in the U.S. adopted by the courts in the United Kingdom.

Northern Shrimp Project

Northern Shrimp survey and assessment activities were carried out in 2009. Staff participated in ASMFC Northern Shrimp Technical Committee meetings to generate the 2009 ASMFC Northern Shrimp Stock Assessment. Work for the assessment included review of fisheries-dependent and -independent data, input of indices into a production model, review of model results, and report section writing and reviewing. In July, project staff participated on one-week legs of the annual northern shrimp assessment survey conducted throughout the Gulf of Maine aboard the R/V Gloria Michelle. Results of the 2009 assessment survey indicated that the 2005 year class (assumed 5-year old females) was moderate in strength and would contribute most to 2009/2010 commercial landings. The 2006 year class appeared weak and the 2007 and 2008 year classes were above average. The Technical Committee recommended maintaining fishing mortality at or below 0.22 and a landings level at or below 4,400 to 4,900 mt depending on the size of shrimp landed. The ASMFC Northern Shrimp Section set the 2009/2010 fishing season at 180 days from December 1, 2009 to May 29, 2010, the same length as the previous year.

Horseshoe Crab Project

Several horseshoe crab monitoring activities were performed in 2009. The annual volunteer-based survey of horseshoe crab spawning beaches was completed in 2009. A total of 358 trips were conducted by almost 300 volunteers and 75 staff from 13 federal and state agencies, organizations, and universities.

Figure 3 depicts the percentage of the total number of crabs that were observed female during the surveys. In some areas, unpaired female crabs were observed attempting to spawn. Sex ratios in Pleasant Bay appeared to be skewed toward male crabs. Since Pleasant Bay supplies a substantial portion of the crabs harvested for biomedical use, this trend bears watching.

Dealer port sampling of Horseshoe crabs was continued in 2009. A total of 1,019 crabs were sampled at three dealerships on four trips. Data were summarized and included in the ASMFC compliance report.

Staff completed a mortality study on post-bled Horseshoe crabs used in the biomedical industry. Crabs were collected from Associates of Cape Cod after bleeding and monitored in holding tanks at the Marine Biological Laboratory in Woods Hole. The percent mortality was calculated for bled crabs and compared to “control” crabs (un-bled). The results of this study were submitted to the Journal of Marine and Freshwater Behavior and Physiology for publication.

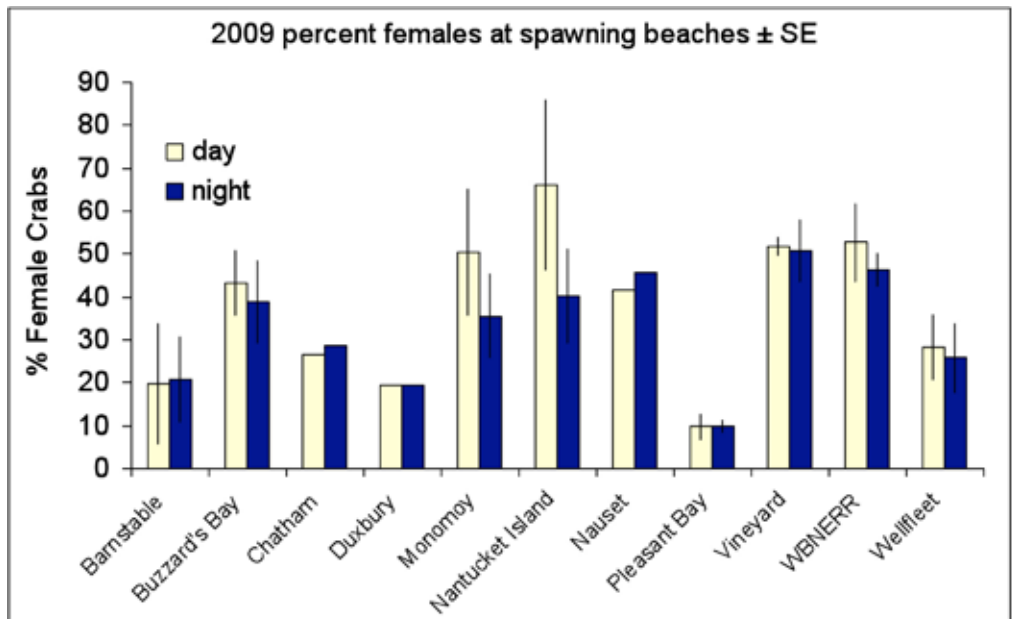


Figure 3. Percent females observed during spawning surveys in Cape Cod estuaries during 2009.

Blue Crab Project

Blue crab regulations were revised to enhance protection for this valued recreational resource. An increase to 5 inches minimum carapace width (CW) and a bag limit reduction to 25 crabs aligns Massachusetts with most of the states along the eastern seaboard. In addition to providing greater protection to mature females, the size increase has the added benefit of enhancing meat yield from a minimally legal crab.

Several Massachusetts coastal town conservation departments had expressed an interest in offering a CW gauge to blue crab fishermen. A minimum legal size of 5 inches facilitates acquisition of a gauge manufacturer from among those companies which are already producing a 5 inch gauge for other states. An awareness campaign describing the regulation changes for blue crabs was planned in 2009. The campaign will be launched in spring 2010 with the distribution of posters, signage, and hand-outs to tackle shops and Town Conservation Departments.

Discussions with researchers at the University of Maryland's Biotechnology Institute revealed that a virulent disease was found in 33% of the blue crabs sampled from the Agawam River in 2008. Additional blue crab sampling was conducted to determine if the disease was still present in 2009. Thirty-five samples were processed, i.e. measured, sexed, maturity assessed, coded and frozen for shipping to the University of Maryland. In addition, salinity, water quality, and water temperature data from the Agawam River were forwarded with the frozen samples. However, 2009 samples were negative for the disease.

Conservation Engineering and Fisheries Dependent Investigations Program

Personnel:

Michael Pol, Program Leader

David Chosid, Marine Fisheries Biologist, Conservation Engineering

Mark Szymanski, Assistant Marine Fisheries Biologist, Conservation Engineering

William Hoffman, Marine Fisheries Biologist

Brian Kelly, Marine Fisheries Biologist, Fisheries Dependent Investigations

Brant McAfee, Marine Fisheries Biologist, Fisheries Dependent Investigations



Overview:

Conservation Engineering and Fisheries Dependent Investigations share a common mission of actively working with commercial fishermen at-sea and collecting information vital to the fishery management process. The two projects largely function independently under one program leader, with frequent mutual support.

The **Conservation Engineering Project** collaborated with industry and others to reduce impacts of commercial fishing gear on non-target species. Innovative scientifically-designed investigations of fishing technology and fish behavior in otter trawls, scallop dredges, gillnets, longlines, and lobster and fish pots were proposed, initiated, continued, and completed.

The **Fisheries Dependent Investigations Project** continued, expanded and adapted to requested sampling at-sea, dockside, at dealers, and at processing plants. In addition to data collection and management, Fisheries Dependent Investigations personnel used the *Marine Fisheries'* line testing machine to test the effects of the trap hauling process on coded-wire tagging of lines. Fisheries Dependent Investigations personnel also provided vital assistance to acoustic tagging and monitoring of striped bass in Cape Cod Bay as well as numerous other projects.

Conservation Engineering Project

Development of a Spiny Dogfish Excluder in a Raised Footrope Whiting Trawl

Testing continued in 2009 of this Northeast Consortium-funded project that aims to exclude dogfish in the fall whiting trawl fishery along the coast of Massachusetts using an angled grid. If successful, expansion of the whiting trawl fishery may be possible. The project is a collaboration with fishermen Frank and Andrew Mirarchi of Scituate and relies primarily on underwater video to assess the effectiveness of the grid. Research was conducted over nine days in September; 24 tows were completed. Video of fish encountering the grid was collected for 23 tows, usually with two cameras mounted in various locations around the grate. Behavioral analysis of recorded fish behavior and statistical analysis of catch data are underway, with initial promising results. An article describing the project was published in the *Commercial Fisheries News*. A poster on the development of a spiny dogfish excluder in a raised footrope whiting net was displayed at the Northeast Consortium Cooperative Partnership Meeting in Portsmouth, New Hampshire. Completion of this phase of the project is expected in 2010.

Determining the Seasonality of Cod Pots

A two-year project to determine the seasonal vulnerability of Atlantic cod to two types of fish pots, funded by the Northeast Consortium was initiated. Cod pots are a potential alternative fishing gear that incurs little or no capture or discard mortality. The project includes continuation of an existing collaboration with a lobsterman and David Martins of UMass Dartmouth's School for Marine Science and Technology (SMAST), with international input from researchers in Newfoundland and Norway. Fieldwork, consisting of three or four consecutive days per month of overnight soaks of pairs of each pot design, was conducted from January through June, and then again in November. A test of the buoyancy of a floating pot was held in the SMAST test tank, resulting in modification of all floating pots. Following budget review, an additional testing period was planned for April 2010. A poster and a Norwegian pot were developed and displayed at the Northeast Consortium Annual Meeting in Portsmouth, NH. A presentation on this project was made to the International Council for the Exploration of the Sea's Study Group on the Development of Fish Pots for Commercial Fisheries and Survey Purposes in Ancona, Italy.

Determining the Best Mesh Size for Gillnetting Monkfish, *Lophius americanus*

This project investigated the size selectivity and bycatch in three mesh sizes of tied-down gillnets. Multiple gillnet mesh sizes were used to establish robust retention probabilities of monkfish, *Lophius americanus*, in a collaborative effort using a commercial fishing vessel with fishermen collecting most of the data. An increase in mesh size of "tie-down" gillnets from 10 inches to 12 inches resulted in an increase in average length overall and an increase in average weight per trip of monkfish 8 lb or greater. Depth appeared to be a significant but minor factor in retention probabilities. Catch of non-target species was limited to 26% of the overall catch, and 13 taxa. Major non-target species catches were also significantly different in different mesh sizes, and in different depths. No protected, endangered, or threatened species were caught in 50 trips. Anticipated revenue from 10 and 12 inch gillnets was similar, despite an 80% decrease in monkfish less than 8 lb, due to premium pricing, increase in catch of large skates, reduced handling time, and reduced gear damage. Decreased catches of smaller monkfish implies lower mortality and increased stock size and reproductive potential.

Design and Testing of the Five Point Trawl

The Five Point Trawl is an innovative sweepless raised footrope trawl designed by Project staff to target haddock and to avoid or to release Atlantic cod. This initiative began in 2004 under the Marine Fisheries Institute (MFI) and fieldwork concluded in 2009 with additional testing on a New Bedford fishing trawler. Project staff joined the crew from the F/V Fisherman on a commercial fishing trip (10 days: April 16-25). This trip was an efficient way for the vessel to become familiar with the experimental gear prior to the experimental trials. Next, the experimental trials were conducted from May 20-27. Trips were staffed by a combination of Project staff, *Marine Fisheries*, National Marine Fisheries Service (NMFS), and industry personnel. Additional data were obtained by allowing the vessel to continue using the net and reporting results. Entry and auditing of all data were completed and analysis of video and data initiated. A progress report was submitted to the MFI. The project's net model was sent to Maine Maritime Museum along with flume tank video and the video titled, "The Five-Point Haddock Trawl Net: Stability Testing". The museum displayed the model with the title: "Net Worth: The Rise and Fall of Maine's Fin Fisheries".

Analysis of Size Selectivity and Bycatch in the Gillnet Fishery for Monkfish

This study was directed by scientists from the Gulf of Maine Research Institute, with analytical contributions from Conservation Engineering. Monkfish were targeted using an otter trawl and tiedown gillnets with a 10", 12", or 14" mesh size. The F/V *Kirsten Lee*, a commercial monkfish vessel that can deploy both trawl and gillnet fishing gear during the same fishing trip, was used. This study occurred in the Gulf of Maine during the summer fishery for monkfish. For the gillnet gears, we found the 12" mesh gillnet had the highest catch of monkfish by weight and the 14" gillnet had the lowest catch both by weight and number. The catch from the 12" and 14" gillnets

was dominated by female monkfish. Individual monkfish length increased with an increase in gillnet mesh size, and the length of trawl-caught monkfish was significantly smaller than that for gillnet-caught fish. Also noted was a significant difference in the length / girth ratio for monkfish between the trawl and gillnet caught fish. Bycatch levels were highest in the 10" gillnets while the lowest levels were seen in the 12" gillnets. The major bycatch species included spiny dogfish, American lobster, thorny skate and Atlantic cod. A decrease in bycatch of spiny dogfish, American lobster and Atlantic cod was noted as the mesh size increased while the thorny skate bycatch increased with mesh size. A report on this project is available at the Northeast Consortium website (www.northeastconsortium.org).

Video

Project files include nearly 1000 different individual videotapes and other media, used to study fish and fishing gear. The videos are archived and stored in New Bedford and are made available to the public on request. Development of a new video database for the conservation engineering video library was completed during the year. The final version was tested and over 900 video records were migrated in from the older database. The new database is simpler to use, captures more data, and includes logging and tagging capabilities.

Fisheries Dependent Investigations Project

Coastal Lobster Investigations and Resource Assessment Sampling

Project personnel are primarily tasked to support lobster monitoring by collecting catch and effort data on participating lobster vessels. Sixty one trips were completed in 2009, with trips originating all along the Massachusetts coast.

Project personnel assisted both the semiannual trawl survey and the annual seine survey conducted by Resource Assessment, as watch chiefs and as deck assistants. Over sixteen sampling trips were staffed with project personnel during the year.

Sampling of other fisheries for various management needs was conducted at-sea and dockside in Nantucket Sound and Buzzards Bay. These included five squid trawl trips and four fluke trawl trips in Nantucket Sound and five whiting trawl trips out of Provincetown. Spiny dogfish, striped bass, and Atlantic cod port samples were collected. In addition, eleven recreational/charter trips were sampled on the North Shore, along with port sampling for large Atlantic cod. Data from these trips were digitized and delivered to NMFS and senior *Marine Fisheries*' staff for interpretation of fishery conditions.

Cod Conservation Zone Investigations

Four commercial demersal longlining vessels conducted an experimental fishery targeting haddock using a manufactured bait, Norbait 700E, in the Cod Conservation Zone (CCZ). Thirty-one trips in April 2009 resulted in landings of 6708 haddock and discard of 43 haddock; 262 Atlantic cod were captured and discarded. The overall ratio of Atlantic cod to kept haddock was 0.038, or greater than 25 landed haddock per cod. Significant differences were found between some vessels in cod to haddock ratios, but all vessels performed better than the defined threshold of 0.1 ($p < 0.05$). Attempts to determine the causes of differences between vessels were confounded by interactions among depth, hooks fished, soak duration, and hook types. Ratios were an improvement over a bait comparison study conducted by *Marine Fisheries* in the same region using Norbait 700E. Revenues were similar between vessels, although costs appeared to be higher for the two vessels using tub gear. The results of this experiment suggest that a small-scale fleet using Norbait 700E can conduct a fishery with low bycatch of Atlantic cod, despite variation in gear configuration. Feasibility of a future fishery depends primarily on the underlying populations of cod and haddock, the number of entrants and effects on price and availability of bottom, and ability to monitor the performance of the fishery.

Protection for Cod Spawning Aggregations

Marine Fisheries has conducted research on protected aggregations of Gulf of Maine spawning cod which has led to a new conservation strategy: surgical temporal and spatial closures to protect remnant Gulf of Maine cod spawning aggregations. In March, *Marine Fisheries* passed a new regulation closing off a portion of Massachusetts Bay (Spring CCZ) to both commercial and recreational cod fishing for the months of May and June. Eight hydroacoustic surveys were conducted to estimate the biomass of cod within that aggregation. An array of acoustic receiver buoys were also deployed around the spawning site and several dedicated tagging trips were made to implant acoustic tags in spawning cod to monitor their behavior and movement patterns while at liberty. Working through the Massachusetts Marine Fisheries Institute (MFI), a partnership between *Marine Fisheries* and UMass/SMASST, studies using acoustic telemetry, data storage tags, traditional tags, and underwater video have improved understanding of the fine-scale population structure of inshore cod, as well as their behavior and movement patterns. Results of these efforts support protection of spawning aggregations that represent the few known remnants of once numerous and diverse historical spawning groups in the Gulf of Maine.

Mature cod show a high level of spawning site fidelity, and some aggregations over-winter in close proximity to their spawning grounds. These spawning groups are genetically unique, indicating they function independently of one another. Conservation and rebuilding of inshore cod stocks will help protect this genetic diversity and increase resiliency enabling cod to better adapt to change and disruptions.

There are two components of the Gulf of Maine (GOM) stock: one found near-shore (between 20-30 nautical miles of the coast) and another on offshore banks and sills of deep basins (both components typically aggregate inshore to spawn). However, the GOM cod stock complex is a mosaic of distinct or semi-distinct spawning groups (subpopulations), many of which are migratory. *Marine Fisheries* has created winter and spring CCZs in state waters which protect Massachusetts Bay and Ipswich Bay spawners in an attempt to prevent depletion of these subpopulations by localized overexploitation while allowing further study of their population structure (Figures 1 and 2).



Figure 1. Multiple age classes of Atlantic cod.

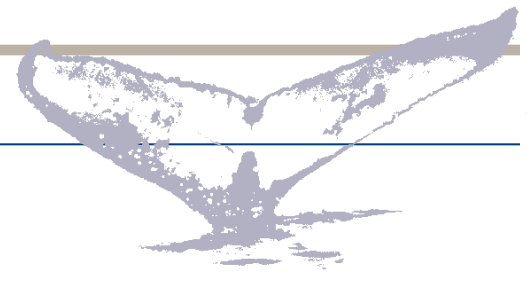


Figure 2. Young-of-the-year cod.

Pelagic Fishery Sampling Deployments

A program was continued in 2009 to quantify the bycatch of non-target species, with particular interest in river herring, American shad, and haddock in pelagic fisheries. Staff provided sampling, logistical and data support, and completed 13 port sampling deployments during this period in Gloucester and New Bedford.

Protected Species Project



Personnel:

Erin Burke, Protected Species Specialist

Robert Glenn, Senior Biologist, Supervisor

Overview:

The Protected Species Project is responsible for activities related to the conservation and management of protected species in Massachusetts waters. This work includes all efforts of the Right Whale Conservation Program, the Cape Cod Bay Right Whale Surveillance Program, acoustic monitoring of right whales, and oversight and participation in work on harbor porpoise and sea turtles. These activities covered a range of issues such as the sea turtle disentanglement network, ghost gear removal, acoustic validation of right whale calls, the Massachusetts lobster labeling and promotion campaign, participation in three federal Take Reduction Teams, general grant management, and providing protected species guidance for *Marine Fisheries*.

Protected Species Activities

Cape Cod Bay Right Whale Surveillance Program

In 2009, the Cape Cod Bay Right Whale Surveillance Program was conducted for the 12th consecutive year, through a partnership with the Provincetown Center for Coastal Studies (PCCS) and the National Marine Fisheries Service (NMFS). The program carried out aerial surveillance and habitat monitoring of right whales in Cape Cod Bay Critical Habitat and adjacent waters. The contract was administered, invoices were processed, and budget issues addressed, in addition to issuing advisories to mariners based on the location of strong aggregations of right whales.

The 2009 season continued the 3-year trend of extraordinary abundance of right whales in Cape Cod Bay. From 2007-2009, the yearly average number of individuals seen ($n=180$) was almost twice the yearly average ($n=82$) observed from 1998-2006 (Figure 1).

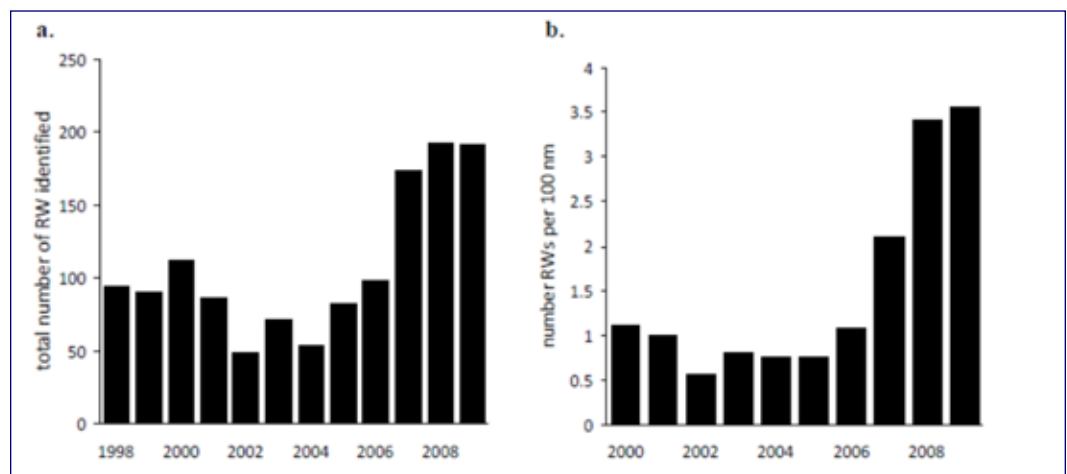


Figure 1. (a) Total number of individual right whales sighted per year, 1998-2009, and (b) number of right whales sighted per 100 nm survey effort, 2000-2009 (effort data unavailable 1998-1999). (From: Leeney et al. 2009. Surveillance, Monitoring, and Management of North Atlantic Right Whales in Cape Cod Bay and Adjacent Waters – Final Report, November 2009.)

During the 2009 season, a total of 187 individual right whales were documented in Cape Cod Bay and adjacent areas – approximately 49% of the known population. Also, 25 “new” right whales were photographed that had never been seen in the previous 11 years of our study.

Large Whale Disentanglement Network

In 2009, staff collaborated with NMFS and the PCCS to combine the contract for the Right Whale Surveillance Program with large whale disentanglement efforts around Massachusetts. NMFS changed the mode of operation for the large whale disentanglement network on the east coast and instituted a more regional model. Consequently, since July 2009, the whale disentanglement effort in Massachusetts has been administered through *Marine Fisheries' Right Whale Conservation Program*.

Right Whale Acoustic Monitoring

Marine Fisheries continued its partnership with Cornell University and Woods Hole Oceanographic Institution to operate a real-time acoustic monitoring system for right whales in Cape Cod Bay (Figure 2). The Project Leader oversees the grants, contracts, and invoices associated with maintaining three real-time buoys in Cape Cod Bay; coordinates with our partners buoy deployment and retrieval, buoy design updates, and the right whale call detection website; and participated in the buoy deployment cruise on December 2, 2008 in preparation for the 2009 listening season.

The 2009 buoys were equipped with elastic hydrophone hoses and a new surface system, wherein the computer hardware and batteries are stored inside the surface buoy. This new design protects the hardware from the elements and provides room for more battery power. The overall goal of the new buoy design is meant to reduce self-noise and false detections, while increasing the listening time provided by the batteries.

The first call was detected in December 8, 2008. Over the course of the 2009 season, 5,558 confirmed right whale calls were recorded on the 3 buoys in Cape Cod Bay. The most calls were recorded at the Sandwich buoy (n=2,235), with similar numbers at the Wellfleet buoy (n=2,062). However, the Race Point buoy recorded approximately half the calls (n=1,261) heard at Sandwich.

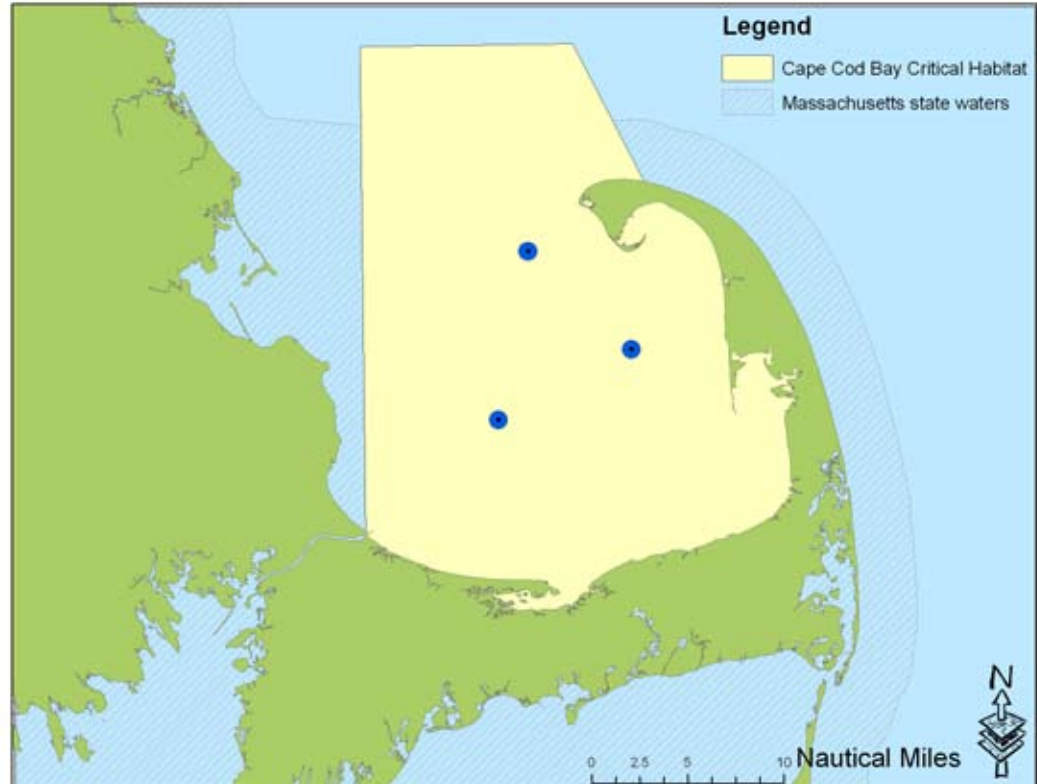


Figure 2. Location of auto-detection buoys for right whales in Cape Cod Bay.

In years past, the buoys' batteries would expire in May or June, soon after the whales are believed to depart the bay and also around the time the buoys would be pulled from the water for refurbishing. However, in 2009, due to the increased battery power, the buoys remained in the water until September 4, and they were available to detect calls the entire time. At each of the buoys, the number and frequency of right whale calls dropped off significantly around early May. But we continued to detect sporadic right whale calls at the Sandwich and Wellfleet buoys until mid-June, with the Wellfleet buoy recording another spike in calls in early August and early September. The Race Point buoy sporadically detected right whale calls throughout the summer, with a spike in early September.

Ghost Gear Removal

During the 2009 right whale season, *Marine Fisheries* partnered again with the Massachusetts Environmental Police (MEP) and local lobstermen to remove non-compliant and abandoned gear from Cape Cod Bay Right Whale Critical Habitat. Locations of gear were reported by the PCCS aerial and habitat surveillance teams. These gear locations were received from PCCS, plotted, and maps forwarded to MEP. Gear removal efforts in 2009 were paid for using state funds and consisted of 15 patrol trips. Over 100 non-compliant pots were collected.

Sea Turtle Disentanglement

Marine Fisheries and the PCCS jointly operate the Massachusetts Sea Turtle Disentanglement Network with funding from a NMFS Endangered Species Act (ESA) Section 6 grant (Figure 3). In 2009 there were 12 confirmed cases of leatherback sea turtle entanglement in Massachusetts waters. Of those cases, nine were successfully disentangled, one entangled live turtle was unable to be relocated, and two entangled animals were found dead in the gear. The entanglement cases involved both whelk and lobster pot gear, plus two cases involving weirs.

The *Marine Fisheries* Program Leader administers the grant for this program, including contracting and processing invoices. She also inventoried the retrieved gear, identified the owners and fishery involved, and assisted NMFS in compiling lists of this information. In October 2009, an Endangered Species Act Section 6 grant application to conduct leatherback turtle research and disentanglement in Massachusetts was submitted. The project, a partnership with the University of New Hampshire and the PCCS, was awarded funding in mid-January 2010.



Figure 3. Disentangling a leatherback turtle from pot gear (PCCS photo: Turtle disentanglement activities conducted under the ESA and Final Rule 50 CFR Part 222).

Massachusetts Lobster Marketing Campaign

In 2009, *Marine Fisheries* continued to support and participate in the lobster promotion campaign to educate consumers about what Massachusetts lobstermen are doing to protect endangered whales. *Marine Fisheries* has partnered with the Massachusetts Lobstermen's Association (MLA), the Whale and Dolphin Conservation Society, and The Ocean Conservancy on a campaign called "Massachusetts Lobster Fishing – The Right Way." The marketing campaign uses labeled lobster bands and informational materials to promote lobsters caught by Massachusetts lobstermen using gear that reduces the risk of whale entanglements.

A poster about the project was designed for the 2009 MLA Annual Trade Show, at which collaboration was undertaken with our partners to purchase and distribute more brochures and provide the MLA with the final supply of bands.

Gear Research

A gear identification study was coordinated using coded wire tags embedded in rope. The project was a collaboration between *Marine Fisheries* and the PCCS to test the feasibility of using microchips to identify the origin of ropes involved in whale entanglements. The microchip-embedded ropes were run on our rope-hauling simulator and also placed out in the field in our ventless trap survey.

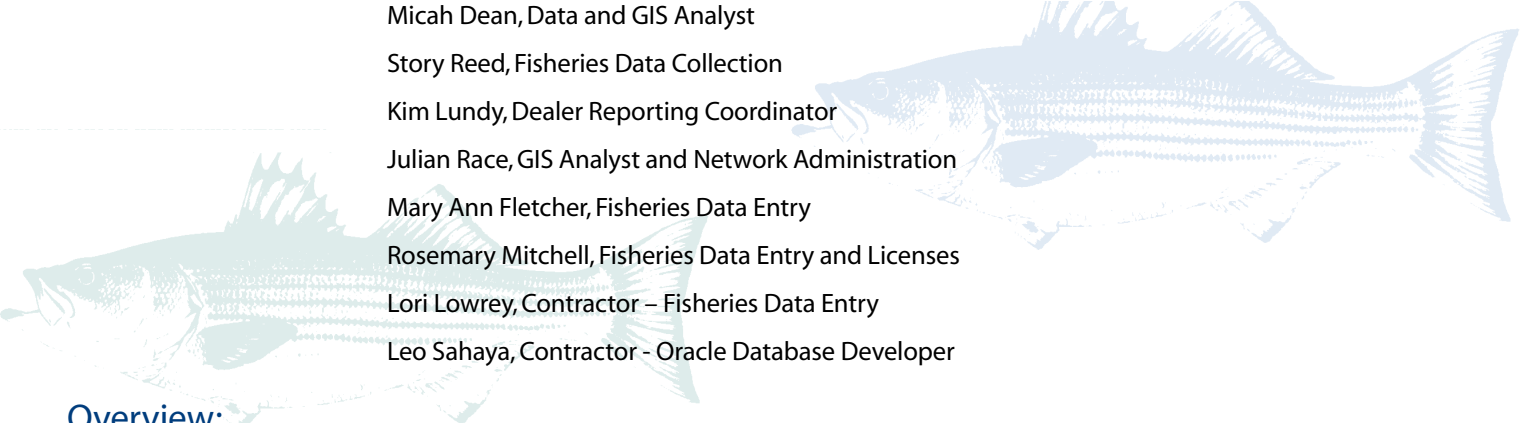
Also, a gear-related study, funded by the International Fund for Animal Welfare, on the use of polyurethane hauling sheaves and knife to reduce rope wear was finalized. This project is the result of on-going collaborations with the Atlantic Offshore Lobstermen's Association, Tension Technology International, and Corrosion Control Resources. Our research found that the steel components of the hauling system can cause significant wear on ropes compared to polyurethane which is more abrasion-resistant. The polyurethane materials were tested on the machine and in the field. Assistance was provided in the distribution of the sheaves to Outer Cape fishermen for field-testing.

Litigation

Richard Max Strahan continued to litigate against *Marine Fisheries* for alleged violations of the Endangered Species Act in relation to humpback and right whales. In July 2009, the Project Leader wrote the third and final status report to US District Judge Nathaniel Gorton regarding entanglement and gear compliance in Massachusetts. This requirement was ordered as a result of a lawsuit filed by Mr. Strahan. In November 2009, a supplement to the status report requirement, informing Gorton of two new entanglement cases which occurred in Massachusetts state waters, was also written.

Management Information Systems and Fisheries Statistics Program

Personnel:



Thomas Hoopes, Project Leader
Micah Dean, Data and GIS Analyst
Story Reed, Fisheries Data Collection
Kim Lundy, Dealer Reporting Coordinator
Julian Race, GIS Analyst and Network Administration
Mary Ann Fletcher, Fisheries Data Entry
Rosemary Mitchell, Fisheries Data Entry and Licenses
Lori Lowrey, Contractor – Fisheries Data Entry
Leo Sahaya, Contractor - Oracle Database Developer

Overview:

Overview:

The **Management Information Systems (MIS) Project** provided many services to the agency including local area network (LAN) 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. *MarineFisheries* uses the Executive Office of Energy & Environmental Affairs (EOEEA) Data Center for its Oracle database applications; other services such as network access, email, Internet website and anti-virus software were provided by the Commonwealth's Information Technology Division (ITD). Standards were adhered to for *MarineFisheries* to have access to and benefit from these centralized services. Finally, geographic information systems (GIS) technical assistance and data layer development continued to occupy a big portion of the project's time as the agency becomes more proficient with the technology and *MarineFisheries*-specific data layers are developed.

The **Fisheries Statistics Project** collects fisheries dependent data from both commercial fishermen (catch and effort) and dealers (landings) who purchase directly from commercial fishermen (primary buyers). Catch and effort data are collected in various forms across multiple fisheries. Dealer data are collected in a standardized trip-level format from all primary buyers. These data are used in many ways, both within *MarineFisheries* 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).

Management Information Systems Project

Website Development and Maintenance

The *Marine Fisheries* website (www.mass.gov/marinefisheries) continued to be an extremely useful means of distributing information. Project personnel continued to make advances in providing more information, in real-time, from this website. An internal Intranet site using Wiki technology was created in 2008 and provides both agency-wide as well as project-specific functionality to agency personnel.

Oracle Database / Application Development and Maintenance

There are currently four production databases that *Marine Fisheries* uses: Commercial Permits and Statistics (FISH2000); Lobster Sampling (LOBSAMP); Shellfish Sampling and Area Management (SHLFSH); Time Tracking for Federal Grants (TimeSheet). The Oracle contractor working for *Marine Fisheries* made several enhancements to the FISH2000 application during the year.

GIS Technical Assistance and Data Development

Project personnel have been working on the following projects in addition to providing support to agency staff:

- An “aquaculture” data layer to help track the various aquaculture operations/permits in the state was created with help from Jerry Moles of the Shellfish Project. Municipalities are currently due to provide feedback on this project.
- Working in concert with a Department of Transportation (*MassDOT*) consultant, progress was made updating an existing anadromous species data layer.
- Work on a bathymetry mapping effort in Dartmouth, MA (data collection and analysis) was done.
- A project to re-vamp how GIS data are stored and accessed on local servers was initiated.
- A variety of maps were produced for several DMF projects, initiatives and regulations, including: the Spring Cod Conservation Zone; areas restricted to purse seining in Boston Harbor; areas exempted from lobster trawl marking restrictions; areas where five white sharks were tagged off Chatham; areas affected by the 2008 red tide; and study area maps for a striped bass tagging study.

Fisheries Statistics Project

Fisherman Catch and Effort Data Collection

Massachusetts commercial fishermen who harvest lobster, shellfish, fluke, sea urchin and striped bass, in addition to those fishermen who deploy gillnets, fish pots or fish weirs to catch a variety of species, are all required by law to submit annual or monthly reports on their fishing activities. Annual reports detail activity, summarized monthly, for the previous year, whereas monthly reports detail activity by trip for the previous month. All reports were processed and entered by project personnel at the Annisquam River Marine Fisheries Station in Gloucester. Depending on the report type, data was entered either to the EOEEA Data Center Production servers, running Oracle database software, located in Boston or to the ACCSP Standard Atlantic Fisheries Information System (SAFIS) database servers, also running Oracle database software, and located in Washington DC. As a quality control measure, a check on the accuracy of annual catch reports submitted by commercial permit holders is conducted comparing data from dealer-reported landings and submitted catch reports.

The number of permit types issued that required a catch report is displayed in Table 1.

Table 1. Number of Permits Issued and Corresponding Reports Entered during 2008.

Catch Report - Annual Reports	# Issued
Coastal Lobster (2008)	1,333
Fish Pot - Conch (2008)	155
Fish Pot - Scup (2008)	163
Fish Pot - Sea Bass (2008)	63
Fluke (2008)	955
Gillnet (2008)	119
Groundfish (2008)	951
Offshore Lobster (2008)	240
Offshore Lobster-Non Trap (2008)	260
Sea Urchin Diver (2008)	106
Sea Urchin Dredge (2008)	146
Seasonal Lobster (2008)	121
Shellfish (2008)	3,279
Striped Bass (2008)	3,821

Catch Report - Monthly Reports	# Issued
American Eel (2009)	118
Contaminated Surf Clam (2009)	17
Fish Weir (2009)	11
Horseshoe Crab (2009)	268
Horseshoe Crab-Bait (2009)	19
Ocean Quahog (2009)	28
Quahog Dredge (2009)	52
Surf Clam (2009)	37
Trip Level (All Species) (2009)	259

Each annual report includes entering all fishing activity by month and economic information (value of gear and vessel, fuel consumption) for the year (Figure 1).

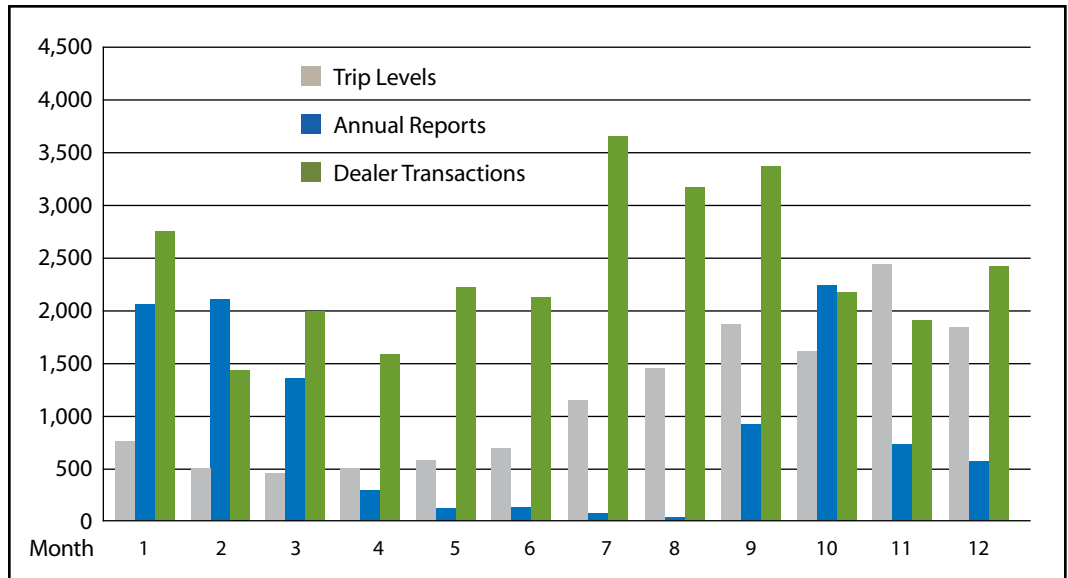


Figure 1. Number of Reports Processed by Month – 2009.

Dealer Landings Data Collection

Landings or purchases of all marine species by primary seafood buyers are collected as part of the dealer reporting program. Starting January 1, 2005, all primary buyers not required by federal law to report electronically, began reporting under state regulations. All data from these state-reporting dealers are entered electronically by dealers or submitted to *Marine Fisheries* via paper forms and entered to the SAFIS database by project personnel. All quotas are monitored using these dealer data stored in the SAFIS database.

As of December 31, 2009, 1,569 businesses obtained a 2009 MA dealer permit of one kind or another. Of those, 437, or twenty-eight percent, were categorized as primary buyers, which meant they intended on purchasing one or more marine species directly from fishermen during 2009. As a result, these dealers were required to report their primary purchases, including products retailed themselves. Of the 437 dealers, 154 had a federal dealer's permit which required reporting electronically to the SAFIS database. These dealers were categorized as "federal-reporting" dealers. The remaining 283 dealers were categorized as "state-reporting" dealers.

Though many of the primary buyers in 2009 were primary buyers in previous years, all must complete paper work each year to confirm their buying intentions and their commitment to the dealer reporting requirements. This registration process not only provides a signed statement for enforcement purposes, if necessary, but also provides the means to monitor reporting compliance and track quotas.

During 2009, 165,700 transactions (not including negative reports) were entered into the SAFIS database, covering over 397,160 individual species landings, or 2.4 species per transaction. Of those, 28,239 transactions (or 17%) were entered by project staff. These transactions were submitted via paper form by dealers who elected not to submit their reports electronically, and were then key-punched by project staff using the ACCSP web-based electronic dealer reporting (eDR) application. Figure 1 shows the number of dealer transactions entered by month by *Marine Fisheries* staff over the course of 2009.

Total landings (in whole pounds), not including certain offshore shellfish fisheries (ocean quahog and surf clams) and large pelagics (bluefin tuna), which are reported through other reporting systems, amounted to 578 million lbs, valued at \$379 million. The top five species in order of value were sea scallop, American lobster, Atlantic cod, haddock and Atlantic sea herring, totaling \$286 million, or 75 percent of the total. When grouped together, inshore and intertidal shellfish such as soft shell clam, northern quahog, blue mussel and oyster amounted to 25 million lbs at \$20.7 million. Landed species with a total gross value over \$1 million are shown in Table 2.

Table 2. 2009 Pounds of MA Landed Species with Value Greater than \$1 Million.*

Species	Lbs (Whole) **	Value
Scallop, Sea	248,553,053	\$197,497,208
Lobster, American	11,573,381	\$41,635,353
Cod, Atlantic	16,170,104	\$20,586,056
Haddock	12,556,146	\$13,274,603
Herring, Atlantic, Sea	134,756,926	\$12,569,773
Goosefish (Monkfish)	9,874,633	\$9,928,429
Flounder, Winter	4,378,444	\$7,290,394
Pollock, Atlantic	11,422,101	\$6,696,213
Clam, Soft	5,004,819	\$6,383,929
Oyster, Eastern	2,430,678	\$5,414,073
Clam, Northern Quahog	6,261,668	\$4,826,239
Flounder, Yellowtail	3,013,532	\$3,968,381
Skates	20,336,372	\$3,888,809
Whelk, Channeled	2,863,252	\$3,720,139
Flounder, Plaice, American (Dab)	2,628,163	\$3,421,547
Flounder, Witch (Gray Sole)	1,710,036	\$3,362,897
Mackerel, Atlantic	31,317,636	\$3,238,229
Striped Bass	1,161,697	\$3,031,331
Hake, Atlantic, White	2,776,497	\$2,783,242
Crab, Jonah	4,871,493	\$2,758,084
Hake, Silver (Whiting)	5,135,650	\$2,498,565
Crab, Atlantic Red	2,230,473	\$2,138,408
Scallop, Bay	2,422,266	\$1,803,237
Clam, Surf	7,978,955	\$1,715,633
Flounder, Summer (Fluke)	731,338	\$1,659,397
Tuna, Bluefin ***	243,758	\$1,641,185
Swordfish ***	662,861	\$1,625,527
Perch, Ocean (Redfish)	3,008,900	\$1,414,882
Squid, Long Finned (Loligo)	1,288,182	\$1,165,353

* As of 19-Feb-2010. Does not include offshore ocean quahog / surf clam fisheries.

** All reported units were converted to whole pounds.

*** May be only a subset of total landings for these species as a separate reporting system is used by NOAA.

The year 2009 marked the third year that all data entered into the SAFIS database for Massachusetts, with the exception of certain offshore shellfish fisheries and large pelagics, were used by NOAA Fisheries in their compilation of the Fisheries of the United States (FUS).



Data Analysis and Dissemination

A database was created to enter, store, and retrieve the massive amounts of data that the acoustic tagging array generated from tagged cod in the Spring Cod Conservation Zone closure within Massachusetts Bay.

Participation on the Fisheries Workgroup of the Massachusetts Ocean Plan development process continued. Several data requests to further the development of the ocean plan were fulfilled.

An extended summer downturn in the ex-vessel price of lobster led to a request from the Massachusetts Lobstermen's Association to evaluate the current price situation and whether anecdotal accounts of above-average catches were likely to cause the price to further decline. In response to this request, five years of dealer-reported price data and two years of fishermen-reported trip-level data were analyzed, the results of which were used to draft a memo placing the price decline and current catch rates in historical context. This memo was used as part of the justification for Governor Deval Patrick's instituting Massachusetts Lobster Day on October 7th, in an effort to stimulate consumer demand.

Monitoring of the Commonwealth's quota-managed fisheries requires much time and attention. To simplify and streamline this process, software was developed that connects to the SAFIS dealer reporting database to query the necessary landings data and forecast likely closure date windows.

Support was given to the ACCSP by developing an algorithm that finds and flags outlier price data during routine daily audits. Staff also represented Massachusetts at the ACCSP's Commercial Technical Committee Meeting.

Requests for Massachusetts fisheries-dependent data included topics such as: lobster, fluke, striped bass, the ports of Gloucester and Duxbury, winter flounder, scallops, tautog, groundfish, herring, sea bass as well as many others. Much time was spent supplying data to support the disbursement of 1.2 million dollars in relief funds to shellfish fishermen affected by the 2008 red tide.

Atlantic Coastal Cooperative Statistics Program Participation and Planning

Landings data through the dealer reporting program is 100% "ACCSP compliant," meaning it has been collected in a trip-level format which meets the ACCSP standard, and has been since 2005. During 2009, DMF collected trip-level data from twenty percent of active lobster permit holders (258 individuals) and will be requiring trip-level data reporting from all commercial permittees in 2010. Extensive planning and development for this new initiative occurred during the year, including the preparation, submittal and acceptance for funding support from ACCSP. Commercial permit holders will either report to National Marine Fisheries Service (NMFS) through the federal Vessel Trip Report (VTR) program, to SAFIS using ACCSP's redesigned web-based application called eTRIPS, or they will submit paper forms, which will be key-punched by DMF staff into the SAFIS database.

As a build-up to comprehensive trip-level reporting, *Marine Fisheries* staff assisted ACCSP with the redesign of their web-based applications eTRIPS and eDR. The redesign provides new features intended to improve the data entry process for both dealers and state partners who use the applications, including expanded favorites, a price board and enhanced reporting.

Fisherman permit and vessel information was routinely uploaded to the SAFIS database. Both the state boat registration database and the U.S. Coast Guard registration database were used to verify registration or documentation numbers for all vessels before adding the vessels to the SAFIS database.

HubLine Impact Assessment, Mitigation, and Restoration Program

Personnel:

Bruce T. Estrella, Program Manager



Overview:

Monitoring and mitigation/restoration activities were conducted by *Marine Fisheries* from 2003 through 2008 in response to assumed impacts from the construction of the HubLine natural gas pipeline in Massachusetts Bay (Figure 1). This program represents the first, large-scale, comprehensive effort by *Marine Fisheries* to assess and mitigate for impacts from a major marine construction project in Massachusetts coastal waters. Although the bulk of the work was completed after 5 years, two Projects, Anadromous Fish Restoration and Shellfish Propagation, continued due to later start dates than the other Projects. Administering HubLine funds, associated accounting tasks, and drafting of the HubLine completion report represented core tasks during this calendar year. The *Marine Fisheries* HubLine web site was updated as program report segments were completed. Several "spin-off" manuscripts from the report were published in scientific journals and work was completed on a less technical version of the HubLine completion report for general distribution.

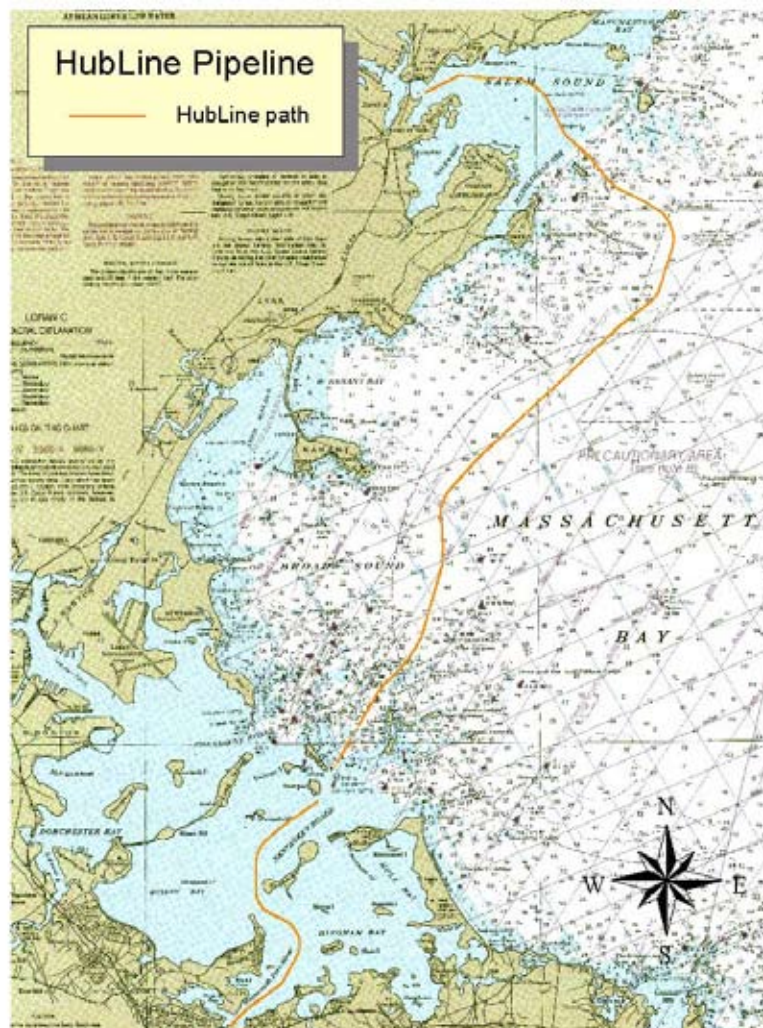


Figure 1. Map of HubLine Natural Gas Pipeline in Massachusetts Bay.

HubLine Completion Report and Budget Reconciliation

Drafting of the HubLine Completion Report entitled: "HubLine Impact Assessment, Mitigation, and Restoration" was a major focus. Editorial comments from reviewers were incorporated and the format was standardized throughout all sections. The **Monitoring and Assessment** segment includes sections on Sediment Relief Monitoring-Sonar, ROV Video Monitoring, Species Diversity, Commercial Lobster Sea Sampling, Suction Sampling of Juvenile Lobsters, Ventless Trap Sampling, and Bottom Trawl Survey Trends. The **Mitigation and Restoration Projects** segment includes sections on Eelgrass Restoration, Habitat Enhancement, Anadromous Fish Restoration in Massachusetts Bay (3 parts: Anadromous Fish Passage Enhancement, American Shad Propagation, Rainbow Smelt Culture and Enhancement), and Shellfish Stock Enhancement.

All segments of the HubLine Completion Report were converted to PDF format and posted on the *Marine Fisheries* web site: <http://www.mass.gov/dfwele/dmf/programsandprojects/hubline/hubline.htm#hub>.

A less technical version of the HubLine Completion Report was drafted in the form of a color pamphlet for distribution to the general public. It can be accessed at: http://www.mass.gov/dfwele/dmf/publications/mr_hubline_brochure_final.pdf.

A spin-off manuscript entitled, *Eelgrass Restoration Used as Construction Impact Mitigation in Boston Harbor, Massachusetts*, was prepared and published in the DMF Technical Report Series, TR 37.

Eelgrass Restoration Project staff conducted the annual post-eelgrass restoration assessment at our planted sites in Boston Harbor; our sites exhibited good growth and had expanded from previous assessments.

Additional HubLine eelgrass restoration responsibilities and associated funding were considered at the request of Algonquin Gas Transmission Company and its subcontractors. Their HubLine post-construction permit requirements included restoration of a swath of eelgrass destroyed off Salem, MA during pipeline construction. It was requested that *Marine Fisheries* accept the task due to our previous success in restoring eelgrass to Boston Harbor, presence of experienced staff, and equipment.

HubLine budget reconciliation was conducted as needed throughout the year and budget updates provided to appropriate staff. Assistance was provided to the federal government on two occasions. Mitigation project options and potential costs were requested by Kevin Kotelly, Army Corps of Engineers, for the Winthrop Beach cobble mining project. The HubLine Program's mitigation efforts were being considered as a procedural guide for implementation when this marine construction project was completed. Also, information on HubLine eelgrass restoration procedures and the cost per acre was provided at the request of the National Oceanic and Atmospheric Administration (NOAA) while planning its eelgrass restoration effort in San Francisco Bay. NOAA will be administering mitigation money toward eelgrass restoration due to impacts from a previous oil spill in the Bay area.

Sportfish Program:

Recreational Fisheries Project, Diadromous Fisheries Management and Resource Assessment Project

Michael P. Armstrong, Program Manager

Personnel:

Recreational Fisheries Project

Paul Caruso, Senior Biologist

Gary Nelson, Senior Biologist

Gregory Skomal, Senior Biologist

John Chisholm, Biologist

Jenni Stritzel-Thomson, Assistant Biologist

John Boardman, Assistant Biologist

Kelley Dumas, Seasonal Fisheries Technician

Matt Ayer, Assistant Biologist

Scott Elzey, Seasonal Fisheries Technician

Joshua Dayton, ASMFC contract technician

Diadromous Fisheries Project

Phillips D. Brady, Senior Biologist

Brad Chase, Senior Biologist

John J. Sheppard, Biologist

Kristen H. Ferry, Biologist

Edward Clark, Carpenter

Luis Carmo, Laborer

Sara Turner, Fisheries Technician

Daniel Syriala, Seasonal Technician

Talia Bigelow, Seasonal Technician

Josh Black, Seasonal Technician

Resource Assessment Project

Jeremy King, Senior Biologist

Matthew Camisa, Biologist

Vincent Manfredi, Biologist



Overview:

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 to support local sustainable fisheries; 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.



Abundance, length frequency, and age classes of key finfish populations are measured for input to stock assessments to determine the status of those resources and to design and analyze management options; habitat and prey needs of key species are assessed; harvest and release of key species is measured; recreational fishing access is promoted and enhanced through the purchase and maintenance of access sites; and information on all aspects of recreational species and fisheries is disseminated to the public.

Diadromous Fisheries Management is responsible for the management, investigations, and assessments of 18 species of diadromous fish stocks in the Commonwealth of Massachusetts. Species such as river herring (alewife and blueback herring), rainbow smelt, white perch, tomcod, American eel, and American shad are evaluated for stock size, local harvests, stock requirements, age composition, mortality rates, sex ratios, spawning areas, suitable spawning habitat, and restoration potential. Information generated by this work is essential in the development of sound management practices for these important species. Since before the time of the Pilgrims, anadromous species have played an important role in the subsistence, sport and commercial fisheries of Massachusetts. Their seasonal abundance provides a ready source of forage and food for other piscivorous species and coastal fishermen.

Diadromous Fisheries Restoration 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 is provided as needed on individual restoration projects.

The **Resource Assessment Project** monitors the distribution, relative abundance, and size composition of marine fish and invertebrates in Massachusetts' territorial waters by conducting annual surveys utilizing consistent protocols. The year 2009 marked the completion of the 32nd consecutive annual spring and fall trawl statewide surveys and the 34th consecutive annual seine survey conducted in South coast and Cape Cod estuaries. Data produced from the surveys is used in assessments of numerous regional fish stocks. In addition the surveys inform fishery management decisions in state waters and contribute to evaluation of coastal alteration projects.

Recreational Fisheries Project

MRIP "For-Hire" Sampling Project

Since 1983, recreational fisheries catch and harvest data has been collected along the Atlantic Coast through the National Marine Fisheries Service's Marine Recreational Information Program (MRIP). *Marine Fisheries* is currently managing the "party boat" survey segment of MRIP for Massachusetts waters, training personnel, scheduling trips, logging data, and maintaining equipment. Daily oversight is provided. During 2009, 57 sea sampling trips were completed, for a total of 106 sampler days and 795 angler intercepts.

Massachusetts Sportfishing Tournament Monitoring Project

Extensive recreational fisheries for sharks, tunas, and marlins off the coast of Massachusetts and also inshore sportfish such as striped bass, bluefish, Atlantic bonito, and false albacore warrant monitoring. In an effort to characterize the relative abundance of these species, the Massachusetts Sportfishing Tournament Monitoring Program (MSTMP) has been collecting catch and effort data at fishing tournaments since 1987. These data allow analysis of annual trends in relative abundance based on angling success. The MSTMP has made efforts to rectify biases in the calculation of catch-per-unit-effort indices from tournament data by surveying tournament participants and working with tournament organizers to collect complete catch information comprising all fish landed, tagged, released, and lost. Data collected include: fishing date, number of boats/fishermen, fishing time, species caught, time of catch, weight, length, sex, bait used, water temperature, disposition of catch, and weather conditions.

In 2009, data were collected at all major big game fishing tournaments held in Massachusetts. Although several tournaments were cancelled due to weather, catch and effort data were obtained from one multi-species tournament and two shark tournaments (Table 1).

Table 1. 2009 Massachusetts offshore fishing tournaments.

Tournament	Location	Species	Dates	No. Boats	Effort (boat hrs.)
Oak Bluffs Monster Shark (23rd ann.)	Oak Bluffs	Shark	7/24-25	130	1241.0
Falmouth Grand Prix (20th ann.)	Falmouth	Billfish/tuna/shark	8/14-15	11	198.0
Nantucket Shark (6th ann.)	Nantucket	Shark	8/5-6	24	456.0
Total				165	1895.0

The MSTMP is important to documenting shark species composition. The National Marine Fisheries Service's (NMFS) Marine Recreational Information Program (MRIP) data do not adequately reflect species composition, relative abundance, and temporal and spatial distribution of sharks and shark nursery habitat off Massachusetts. While the MRIP indicates that 99% of the sharks caught by Massachusetts recreational fishermen in 2009 were spiny and smooth dogfish, MSTMP data indicate that, of the 968 sharks caught during Massachusetts big game fishing tournaments in 2009, 90% were blue sharks (*Prionace glauca*), 8% were shortfin makos, 1.5% were common thresher sharks (*Alopias vulpinus*), and the balance included a single tiger shark (*Galeocerdo cuvier*) and a single porbeagle (*Lamna nasus*; Table 2). The MRIP failed to detect most of the shark species picked up by the MSTMP. Although MSTMP data represent only tournament-caught sharks taken in offshore waters (>3 miles), they do provide an indication of species composition, landings, and catch rates for important recreational shark species in Massachusetts.

Table 2. Estimates of 2009 recreational shark landings in Massachusetts from various sources.

Species	Boated	Released	Tagged	Total	% Released	Weight (lbs)
MSTMP*						
Blue		889	28	917	100.0	
Shortfin Mako	9	70	3	82	89.0	1,162
Common Thresher	8	8		16	50.0	1,831
Tiger		1		1	100.0	
Porbeagle	1			1	0.0	361
Total	18	968	31	1,017	98.2	3,354
MRIP**						
Spiny/Smooth Dogfish	4,968	623,998		628,966	99.2	20,018
Sandbar/ Unidentified		106,738		106,738	100.0	
Total	4,968	730,736		735,704	99.3	20,018

* DMF Massachusetts Sportfishing Tournament Monitoring Program

** NMFS Marine Recreational Information Program (Source: NMFS, Fisheries Statistics Division)

Policy, Technical Committee, and Stock Assessment Support

Participation on various technical committees of the Atlantic States Marine Fisheries Commission (ASMFC) and Mid-Atlantic Fishery Management Council (MAFMC) is ongoing. Stock assessment updates were undertaken, presented to Management Boards and/or reviewed, and management options discussed for key recreational species including: summer flounder, tautog, scup, bluefish, black sea bass, sturgeon, striped bass, and river herring.

Potential regional bag, size, and season restrictions were drafted for scup. Tautog, bluefish, black sea bass, summer flounder and scup databases of catch, landings, and adult and young-of-the-year (YOY) survey indices were updated, trend analysis performed, and predictive relationships examined.

AD Model Builder computer programs were developed for estimation of recruitment of river herring in the Monument River, R computer programs were developed for the application of time series models to trawl survey data for river herring, simulation models were developed to test survival estimation methods using tagging data, the current ASMFC statistical catch-at-age model for striped bass was updated, and striped bass and menhaden monitoring reports were prepared.

Coordination of law enforcement actions for recreational species is routinely effected with Massachusetts Environmental Police (MEP) and regulatory updates are communicated to *Marine Fisheries* licensing staff for commercial summer flounder, scup, black sea bass, bluefish, and tautog fisheries.

Work continued on the recreational angler registry initiative, including drafting of a Memorandum of Agreement and proposal for registry exemption for Massachusetts for-hire vessels. A Recreational Permit Implementation Team reviewed outreach materials and regulation changes to support the registry and the eventual recreational permit that will be required in 2011.

Striped Bass Recreational Fisheries Sampling

Work continued on the development of the Sportfish Angler Data Collection (SADCT) program. Angler data from 2009 were entered into the database, compiled and analyzed, and a report was written and mailed to participating volunteer anglers. Over 1,600 striped bass length/age samples were collected by participating SADCT anglers.

In conjunction with the Atlantic Coastal Cooperative Statistics Program (ACCSP), the web-based eLogbook was developed, beta-tested, and launched in 2009. An informational brochure explaining the eLogbook was also created and distributed to anglers at fishing shows. One-hundred and forty five anglers registered with the eLogbook in 2009.

Striped Bass Tagging and Sampling

During 2009, 14 trips were made aboard contracted vessels and 504 striped bass were tagged (Figure 1). Staff, volunteer anglers, and vessel captains were coordinated via daily phone and e-mails for all trips. Trip data were entered into appropriate databases.

The two-year study to examine the inshore-offshore movements of striped bass along the Massachusetts coast continued with acoustic tagging of fish in 2009. Three arrays comprising a total of 44 receivers were set in May and retrieved in October. Over 50 striped bass were tagged with acoustic transmitters. Analyses of striped bass temperature tag data were completed and a manuscript was submitted and accepted for publication in *Fisheries Oceanography*.

Twenty-five market sampling trips were made to collect age and growth parameters from commercial catches; 526 fish were sampled (Figure 2). Scale preparation and reading of 1,097 age samples from commercial market, volunteer recreational angler program, and the tagging study were completed.



Figure 1. Tag insertion on striped bass.



Figure 2. Striped bass length/age/growth processing.

Age and Growth Laboratory

In 2009, the new Age and Growth Lab located at the Annisquam River Marine Fisheries Station in Gloucester was opened. Federal funding from the Sport Fish Restoration Act (Wallop-Breaux) allowed the renovation of two existing lab spaces to form a new age and growth center where the majority of the agency's fish ageing will take place. The new lab was outfitted with state-of-the-art equipment for processing the varied structures used for ageing, including scales, otoliths, opercula, vertebrae, and fin rays. In 2009, laboratory personnel aged striped bass scales and otoliths, tautog opercula, and river herring and smelt scales and otoliths.

Tautog Age and Growth

Massachusetts started voluntary age and growth sampling of tautog in 1995 and it has continued a limited sampling program to the present. It has been invaluable in regional stock assessments due to the lack of age sampling by neighboring states in past years. The 1995 stock assessment of tautog, on which the first interstate fishery management plan (FMP) was based, used an age-length key developed from Connecticut and Rhode Island data only. This was found unacceptable and improvement in the age-length keys for future assessments was first sought through voluntary participation in age and growth sampling by participating states, and second through a 2002 FMP amendment requiring sampling (200 age samples per state per year). The resulting age/length data from Massachusetts was used in coast-wide stock assessments and a local assessment for Massachusetts and Rhode Island which allows these two states to manage tautog unilaterally in addition to continuing to contribute to the overall ASMFC assessment and management process.

Continuation of this age work remains critical to the stock assessment process and in 2009 Marine Fisheries obtained a total of 271 tautog through directed sea sampling and purchase from commercial fishermen. Opercula were obtained from most samples, cleaned and read. Age data was entered into the database and a 2009 age-length key was created.

Rainbow Smelt Population Monitoring

Rainbow smelt are a popular sportfish 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 using in-stream fyke nets in 2004. The project has received funding support from the National Oceanic and Atmospheric Administration's (NOAA) Office of Protected Species under two grants. Thirty-three fyke net hauls were made over an 11 week season in eight coastal rivers in 2009 with concurrent sampling of water quality parameters. Work included PIT (Passive Integrated Transponder) tagging of smelt in the Fore River, Braintree, to track spawning run movements, acquisition of smelt gametes used for restoration stocking of

marked larvae, and genetic sample collection for a study under the NOAA grant collaboration. The fyke net catches of smelt provide a relative index of population abundance and age-structure data. Smelt catches in 2009 were the lowest of the 2005-2009 time series. Three river stations had less than 20 smelt caught for the entire season. The Fore River has the largest smelt run among sampling stations and had the highest catch of 888 smelt in 2009; well below the 2005-2008 average of 2,263 smelt. The tracking of year-class strength may reveal the lower catches in 2009 were related to poor recruitment from the 2007 cohort.

American Shad Propagation

Marine Fisheries, in collaboration with the U. S. Fish and Wildlife Service (USFWS), began work in the spring of 2006 to restore American shad to the Charles River. Adult shad were captured during the spring spawning run from the Merrimack River at the Essex Dam in Lawrence. Fish were transported to the USFWS National Fish Hatchery in Nashua, NH and were volitionally spawned in tanks from May through July. Collected embryos were then incubated and hatched before being marked with oxytetracycline hydrochloride (OTC) and transported to the Charles River in Waltham for release. The work has continued each year through 2009 and will continue for at least three more years. The numbers of stocked larvae have ranged from around 1 million to nearly 4 million annually. Fall juvenile electroshocking surveys have been conducted each year before migration to the ocean and OTC-marked juveniles have been found. Continued work will include more stocking and subsequent monitoring of the Charles River each spring for returning OTC-marked American shad.

American Eel Population Sampling and Passage Enhancement

All East Coast states conduct standardized monitoring of YOY American eel 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 relative index of eel population abundance. YOY monitoring stations are also maintained in the Acushnet, Saugus, and Parker Rivers. The project targeted 40 Sheldon trap hauls over a 10 week season at the four stations in 2009. The Jones River trap catch of 8,146 eels was the third lowest in the nine year time-series. This lower catch followed four consecutive years of higher catches in the range of 18 to 20 thousand eels. We also work with volunteer organizations to monitor juvenile eels using eel passage ramps in the Saugus River, Wankinco River, and Cold Brook. The eel ramps were designed by *Marine Fisheries* starting in 2007 to allow eels to pass over dams. Eel ramp catches represent a census of eels able to move upstream of the dams. The seasonal catches at the ramps has been 5 to 10 thousand eels, with the exception of over 25,000 eels passed at Cold Brook in 2009.

Habitat and Access

Periodic site monitoring and site improvements were made to the Craven's Landing Access site at Scorton Creek in East Sandwich. This included the procurement and installation of new fence rails, new signage, and fencing for the improved parking plan. Regular communications with the property's neighbors were maintained as well as routine contact with MEP staff regarding enforcement of the rules. Warning letters were drafted and sent to several violators of site rules. Recruiting and supervising of seasonal patrol help was completed.

Only two fish kills were investigated in 2009. Neither required any noteworthy expenditure of project staff time or resources.

Routine communication regarding local fisheries resources and fisheries activity was maintained with Environmental Review Program staff. In addition, four project leader meetings were attended for the purposes of providing input on ocean planning and environmental review. Several days were expended by Matt Ayer performing a site evaluation for an artificial reef project and site visits for anadromous fisheries habitat impacts on the North Shore.

Recreational Fishing Derby

Marine Fisheries administered the annual Saltwater Fishing Derby. This included regular communications to weigh stations, preparing press releases for derby promotion and announcement of winners, logging of certified weigh-in shops, and tracking of derby standings in a data base. Winners were recognized with awards at the annual Worcester Sportsmen's Show in Worcester, MA.

A proposal for a catch and release derby component was drafted and approved. Staff facilitated the creation, completion, and distribution of promotional materials, press releases, new derby affidavits, and derby rules pamphlets.

Massachusetts Shark Research Program

Marine Fisheries established the Massachusetts Shark Research Program (MSRP) in 1989 to more fully elucidate the ecology, distribution, and relative abundance of sharks subject to fisheries off the coast of Massachusetts. The MSRP conducts angler and longline surveys as well as opportunistically collects information and samples from recreational and commercial fishermen. Biological parameters including age structure, feeding ecology, movements, and reproductive status are examined through dissection and tagging of shark specimens. The goals of the MSRP are to foster cooperative shark 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 sharks.

Tagging of Great White Sharks

On Labor Day weekend, 2009, the presence of several white sharks (*Carcharodon carcharias*) off the coast of Cape Cod grabbed the attention of state and local officials, worldwide media, and *Marine Fisheries* biologists. The sharks were first spotted by pilot George Breen, who saw the large sharks along the east coast of Monomoy Island while flying over the area. Senior *Marine Fisheries* biologist Greg Skomal subsequently returned to the area with the spotter pilot and confirmed the presence of five sharks off the coast of Monomoy in close proximity to grey seals (Figure 3).

Over the next five days, *Marine Fisheries* biologists worked with commercial fishermen Bill and Nick Chaprales on the F/V Ezyduzit to tag the sharks. With the aerial assistance of George Breen, the harpoon vessel was directed to white sharks swimming in the area. Using a modified harpoon, Bill Chaprales was able to tag five white sharks, ranging from 8-13 feet long, from the pulpit of the boat.

All five white sharks were tagged with Pop-up Satellite Archival Transmitting (PSAT) tags. In contrast to standard satellite tags, these tags do not transmit real-time positions, but instead act as dataloggers, which collect and store temperature, depth, and light level data. At a time programmed by the researcher, the tags will pop-off the sharks, ascend to the surface, and transmit archived data to satellites, which relay them back to the researchers. At that time, the three-dimensional movements, including migration paths, depths, and temperature preferences of the shark can be re-created based on those data.

This was the first successful effort to tag white sharks in the North Atlantic. The PSAT tags do not allow for real time monitoring, but they do collect more comprehensive information on the movements of the sharks; they were programmed to release in January, March, and May of 2010.



Figure 3. A great white shark (upper right corner) lurks near a group of grey seals.

Outreach

Staff communicated on recreational fisheries topics with the general public and recreational fishing community, including organized groups such as local schools, the Osterville Anglers Club, the Barnstable County League of Sportsman, and the Cape Cod Salties. Informational materials were distributed at the Standish Sportsman's Club, Eastern Fishing and Outdoors Exposition, Massachusetts Striped Bass Association Expo, the Rhode Island Saltwater Anglers Association Fishing Expo, the New England Boat Show, Needham Sports Club, and the Topsfield Fair.

The annual Anglers Guide was printed and distributed to over 140 bait and tackle shops and 30 similar venues. Annual Regulatory Abstracts were updated and distributed to those same venues.

Diadromous Fisheries Project: Management Activities

Propagation

Efforts to reestablish, augment and enhance natal anadromous runs in conjunction with ongoing fishway improvement projects, included a total of 11,500 pre-spawning adult river herring trapped and transported via stocking truck or lifted above a barrier into seven coastal systems throughout the Commonwealth. The seven systems that received gravid fish in 2009 were: Agawam River, Plymouth/Wareham; Town Brook, Plymouth; Island Creek, Duxbury; Monument River, Bourne/Plymouth; Three Mile River, Dighton; Ten Mile River, Seekonk; and Upper Mystic Lake, Arlington/Medford. An additional 2,000 alewife were trapped from a Massachusetts donor system and released into two Rhode Island coastal systems in an effort to sustain that state's small populations. Restoration efforts of the American shad to the Charles River system also continued with the introduction of 3.8 million shad fry into the waters around the Woerd Avenue Boat Launch in Waltham; assessment of these efforts is ongoing.

Construction and Improvements to Passage Facilities

A total of 20 different fishways in 15 different river systems were attended to prior to the commencement of the 2009 spring spawning migrations (Table 3).

Table 3. MA river system and town where work was performed.

Harodite Dam fishway	Dighton
Hunters Pond Dam fishway	Cohasset
Shad Factory Pond fishway	Rehoboth
Veterans Memorial Park fishway	Marshfield
Elm Street Dam fishway	Kingston
Wapping Road Dam	Kingston
Mill Pond Dam fishway	Wareham
Northbound Route 25 Red Brook stream baffles	Wareham
Route 130 Crossing fishway	Mashpee
Mashpee Pond Control Structure	Mashpee
Santuit Pond Dam fishway	Mashpee
Mill Pond Dam flume	Barnstable
Lake Elizabeth Outlet	Craigville
Newfield Street Dam fishway	Plymouth
Watertown Dam fishway	Watertown
Moody Street Dam fishway	Waltham
Upper Shawme Pond fishway	Sandwich
Lower Shawme Pond fishway	Sandwich
Jenny Grist Mill Fishway	Plymouth
Old New Bedford Reservoir fishway	Acushnet

A major reconstruction and rehabilitation job was undertaken at the Russell's Millpond fishway on the Eel River in Plymouth (Figure 4) following direct technical input and design review from



Figure 4. Russell's Millpond fishway construction, Eel River, Plymouth, MA.

the USFWS and the *Marine Fisheries* Anadromous Fish Management Project. This dam rebuild and fishway restoration was conducted by the dam owner at a cost of several hundred thousand dollars and reopened a fishway that had been inoperable for more than a decade, reestablishing access to approximately 45 acres of alewife spawning habitat.

Marine Fisheries worked closely with the town of Sandwich to evaluate the new Alaskan Steeppass fishway installed within the rebuilt Upper Shawme Pond dam (Figure 5).



Figure 5. Alaskan Steeppass installation at Upper Shawme Pond, Sandwich, MA.

We provided a Smith Root 903-D electronic fish counter, counting tunnel, and mounting cradle for installation at the exit of the new fishway to assess fish passage over the course of the 2010 spring river herring spawning run. The dam rebuild and fishway installation reestablishes fish passage into the uppermost spawning area of the system, essentially doubling the potential spawning habitat and providing full up-stream access for a fish run which has supported river herring harvest and management since the 1800s. In addition, the crew worked on at least one site project each month throughout the year, clearing river debris, constructing fish diverters, trash racks, construction forms, fishway baffles, coffer dams and eel ramps as required for the Anadromous Management project, local partners, and constituent groups

Biological Assessments for River Herring (*Alosa pseudoharengus*, *A. aestivalis*)

The alewife, or branch herring, is the most abundant anadromous fish in Massachusetts. A close "cousin" is the blueback or glut herring which, although a separate species, is often confused with the alewife and is usually lumped together with them under the heading of river herring. Biological studies continued with adult river herring counts and sample collections from the Monument River, Bourne Dale; Town Brook, Plymouth; Mystic River, Medford; Agawam River, Wareham; Wankinco River, Wareham; Mattapoissett River, Mattapoissett; Nemasket River, Middleboro; Merrimack River, Lawrence; and the Acushnet River, Acushnet. A total of 2,078 river herring and 202 American shad were sampled and assessed from seven of these nine coastal systems. Data indicates that river herring populations are truncated in age structure, with fewer older fish being collected and fish are apparently smaller at age than in past years. Electronic monitoring of several coastal systems indicated that there was a slight increase in the number of

fish returning to their natal spawning grounds in 2009. Counts varied from approximately 10,000 fish in the Mattapoisett River, Mattapoisett to 760,000 in the Nemasket River, Middleboro.

To improve population assessment of river herring, *Marine Fisheries* funded, for the second year, the Massachusetts Cooperative Fish and Research Unit, University of Massachusetts-Amherst to develop needed technology for an inexpensive and accurate automated digital video system that will count migrating river herring in coastal streams and which can produce scientific and reliable population estimate data. Estimates generated in the second field season of this approach yielded the following population estimates: 57,414 fish in Back River, Weymouth; 68,190 fish in Charles River, Watertown; and 108,610 fish in Town Brook, Plymouth. Work on this approach will continue to be improved and refined for possible applications by local municipal natural resource departments.

Passage of diadromous species is monitored during the spring/summer each year at the first obstruction on the Merrimack River in Lawrence, Massachusetts. Counts of American shad on the Merrimack River for 2009 were similar to 2008 with 23,199 fish lifted over the Essex Dam in Lawrence. This remained an improvement over the 15,876 lifted in 2007 and the 1,205 lifted in 2006. Forty-three striped bass, 2,041 sea lamprey and 1,456 river herring were also lifted above the dam in 2009.

Diadromous Fisheries Project: Restoration Activities

HubLine Restoration

Anadromous fish restoration is a component of HubLine mitigation and resource restoration efforts. In 2007 and 2008, scopes of work were drafted for the following five HubLine restoration projects: Herring River (Pembroke), Bound Brook (Scituate), Weir River (Hingham), Back River (Weymouth), and the Fore River (Braintree). All but the Bound Brook projects were active in 2009 and the Fore River feasibility study was completed.

Feasibility Study on Restoring River Herring to the Fore River, Braintree: The final project report by Gomez and Sullivan Engineers, P.C. was reviewed and project results were presented to the Tri-Town Water Commission in Braintree in January and at a public meeting on the project in March. Effort was spent later in the year to find funding for the next stages of the Fore River restoration project, including proposals submitted to the USFWS and NOAA American Recovery and Reinvestment Act (ARRA) funding.

Weir River Smelt Habitat Restoration: Work began to contract the project design and permitting for smelt habitat restoration below the Foundry Pond Dam in the Weir River, Hingham. A request for response (RFR) for the project was posted in July, following which eleven proposals were received and reviewed. The "kick-off" meeting with selected contractor Gomez and Sullivan Engineers was held in October. This meeting was followed by a site visit and finalization of the scope of work.

Back River Anadromous Fish Habitat Improvement: Work continued in assisting the Town of Weymouth to process a contract for removing sediment from the channels of the Back River river herring and smelt runs. Staff investigated sediment removal technologies and reviewed Weymouth's request for proposals (RFP) for contracting the sediment removal. Channel improvement work was planned for early 2010 for both river herring migratory and smelt spawning habitat.

Herring Brook Fish Ladder Replacement: A project to replace the fish ladder in Herring Brook in Pembroke began in 2009 with an agreement to have the MA Public Access Board (PAB) lead the development of engineering plans. Discussions were held with the PAB during 2009 to plan for this job. Project activity in 2009 included communications with the Office of Dam Safety, surveying the dam by PAB that supports the fish ladder, and drafting an RFR for structural engineering assistance for the project.

Anadromous Fish Restoration Priority List

A major effort was undertaken to complete the update of the anadromous fish restoration priority list and to coordinate the datafile with interests in developing a GIS data layer linking anadromous fish habitat to MassDOT infrastructure. The South Shore region and Cape Cod region of the restoration priority list were completed in 2009 and work began, but was not completed on the Buzzards Bay region, the last of four regions on the priority list.

River Herring Habitat Assessment

An effort was initiated in 2007 to develop Standard Operating Procedures (SOP) for assessing river herring spawning and nursery habitat. The SOP is part of a larger effort to finalize a Massachusetts Department of Environmental Protection (*MassDEP*) approved Quality Assurance and Program Plan (QAPP) for water chemistry and habitat measurements related to diadromous fish habitat. The intention is to develop protocols for assessing habitats that can interact with *MassDEP's* Surface Water Quality Criteria and contribute to *MassDEP's* Watershed Assessments. *MassDEP* reviewed draft SOPs for temperature loggers, water chemistry sondes, rainbow smelt spawning habitat assessment, and river herring spawning and nursery habitat assessment in 2007 and 2008. In November 2009, *MassDEP* approved the QAPP and the document was submitted to the *Marine Fisheries* Technical Report Series. With this approval, water quality data collected by *Marine Fisheries* while conducting diadromous fish habitat assessment can be applied to *MassDEP* watershed assessment processes mandated by the Clean Water Act.

Monthly assessment trips were made from May through September at Silver Lake in the Jones River watershed and Hathaway Pond and Leonard's Pond in the Sippican River watershed. Also, drafting of the Upper Mystic Lake river herring habitat assessment report began; the first such report under the QAPP. Data processing for 2007 and 2008 monitoring was completed in 2009 and a draft report was nearly complete by the end of 2009.

Completed Projects (*Marine Fisheries* lead)

Wankinco River Eel Ramp: A new eel ramp was deployed at the Wankinco River in Wareham in April 2009. The eel ramp was constructed by cranberry harvester A.D. Makepeace following a *Marine Fisheries* design with assistance from Alex Haro (USGS Conte Laboratory, Turners Falls, MA). A monitoring effort began with the Town of Wareham and over 6,000 eels were passed by the ramp by the end of June.

Feasibility Study on Restoring River Herring to the Fore River: Project contractor Gomez and Sullivan Engineers, P.C. delivered a final project report in March 2009. The 104 page feasibility report provides detailed hydrologic and hydraulic information supporting passage improvement at impediments to river herring passage in the Fore River. The feasibility of river herring restoration depends on active management by the regions water suppliers. At the conclusion of the study, letters were received from the Town of Braintree and Tri-Town Water Commission voicing support for moving the project to the design phase.

New/Ongoing Projects (*Marine Fisheries* lead)

In addition to the projects outlined above, the following projects are divided by their status as either a project for which *Marine Fisheries* is the proponent or projects that other entities lead and *Marine Fisheries* offers technical assistance. Numerous other potential projects and information requests received minor attention in 2009.

Town Brook Smelt Spawning Habitat Restoration: Efforts were resurrected on the restoration of the long-standing degradation of smelt spawning habitat in Town Brook, Quincy. An ISA was drafted and submitted to utilize mitigation funds from court settlement of the 1997 smelt egg kill during the flood control project construction. A project scope was also drafted and submitted to Gomez and Sullivan to solicit a contract bid. In March a site visit was made with

Mark Wamser of Gomez and Sullivan, followed by a submission of a project scope and cost estimate. Progress was stalled later in the year as attempts to schedule a meeting with the City of Quincy were unsuccessful. The project will focus on retrieval of Town Brook flows diverted to the flood control tunnel. The success of this project is fully dependent on partnering with DCR and the City of Quincy.

Cockeast Pond Fishway Improvement: A site visit was attended with Westport Town officials to scope out culvert improvements into Cockeast Pond near the West Branch of the Westport River. A restoration proposal was drafted and circulated by *Marine Fisheries* to project partners to correct poor passage at the culvert and facilitate the project with the Town of Westport. It was agreed that *Marine Fisheries* would provide a design for a modified weir to assist herring passage into the culvert in early 2010.

Fore River Diadromous Fish Restoration: The next phase of the effort to restore river herring to the Fore River watershed in Braintree began in 2009 with an agreement to have the USFWS design fish passage improvements at two locations. A site visit was attended with Dick Quinn of USFWS to record baseline survey data needed to prepare scoping designs for a fish ladder at Hollingsworth Pond Dam and a bypass channel at the rock falls downstream of the dam. The USFWS agreed to produce these designs by the end of FY10.

MassDOT Diadromous Fish GIS Project: Early in 2009, a project scope was drafted for hiring a contractor to assist with preparing a GIS datalayer that includes diadromous fish habitat and MassDOT transportation routes and structures. In November a conference call was attended to discuss contract plans. It was agreed to hire a GIS contractor to carry out *Marine Fisheries* scope. Following the conference call the project was approved by MassDOT, and *Marine Fisheries* edited and submitted a final version of the project proposal in December.

Ongoing *Marine Fisheries* Technical Assistance

Potential restoration projects are reviewed upon request from local, state, and federal agencies and interests. The assistance provided ranges from brief technical advice to signing onto long-term projects as an active partner. In addition, routine assistance is provided upon request to potential projects in the form of site visits, proposal reviews, support letters, and information on existing resources.

Wapping Road Dam Removal: *Marine Fisheries* reviewed and commented on the second draft of a feasibility study on the Wapping Road dam removal project in Kingston. A support letter was drafted for the project's 2009 application to the GOM Council and a site visit and conference call were attended to discuss the evolving design. Discussions were initiated with the City of Brockton's Water Department to plan fish passage improvements in Silver Lake in the Jones River Watershed following dam removal.

Great Pond River Herring Passage Improvement: A new project was launched to improve river herring passage into ponds upstream of Great Pond in Eastham. Following two site visits in 2008, a site visit memorandum was drafted and literature was reviewed as part of project design. The restoration proposal was drafted with the Town of Eastham (the local lead), and submitted for grant consideration to the USFWS and Natural Resources Conservation Service (NRCS).

Red Brook Fishway Improvement: USFWS designs for improving fish passage at Red Brook in Bourne were reviewed and a site visit was attended. A restoration proposal memorandum was drafted for project partners and a second site visit was coordinated and attended with project partners and the Town of Bourne.

Leonard's Pond Fish Ladder Replacement: USFWS scoping designs for the Leonard's Pond fish ladder replacement were completed and the plans were presented to project partners, lead by the Town of Rochester. The Town received a grant from the Buzzards Bay National Estuary Program, and upon request, a draft RFR for contracting engineering plans was prepared for the Town of Rochester.

Grass Pond Eel Ramp: The second season of operating an eel ramp at a dam on Grass Pond in Harwich was successful beyond expectations. Nearly 26,000 juvenile eels were passed by the ramp which was constructed by *Marine Fisheries* in 2008 and monitored by a partnership with the Town of Harwich and Harwich Conservation Trust (HCT). An NRCS grant to HCT funded the *Marine Fisheries* fishway crew in the construction of the durable custom aluminum ramp which replaced a pilot wood ramp that moved only about 6,000 eels in 2008.

Mystic Lakes Dam Fish Ladder: The DCR is reconstructing the Mystic Lakes Dam including a fish ladder and eel ramp. This project represents one of the highest priority projects in this region for *Marine Fisheries* in the last two decades. *Marine Fisheries* and Medford Boat Club organized a herring bucket brigade from 2005-2009 which helped garner local and state support for the dam project. DCR's preliminary fish ladder design, which was drafted from a USFWS scoping design, was reviewed and a proposed eel ramp was discussed with DCR consultants.

NRCS Cape Cod Plan: The NRCS Cape Cod regional restoration plan was approved by US Congress after nearly 10 years of planning. The restoration plan has the potential to address the most outstanding fish passage projects on Cape Cod over the next 10 years. Six meetings were attended on this project in 2009, which included Department staff, NRCS, and regional ACCP representatives. A "short-list" of fish passage projects was drafted for consideration if pending ARRA funds become available for immediate project funding. Enhanced review of potential projects in the Cape Cod region was conducted while working on this project and the *Marine Fisheries* priority list.

Pilgrim Lake Fishway Outlet: Project design, permitting, and contracting were conducted for the fishway outlet reconstruction at the Pilgrim Lake herring run in Orleans. This effort included a meeting, a site visit, and drafting of a restoration proposal memo for project partners. Significant effort was spent helping the local partners satisfy NRCS requirements of the Wildlife Habitat Incentive Program grant received for the job. The initial contractor backed out and the funding agency NRCS requested enhanced engineering plans which *Marine Fisheries* agreed to fund. A service contract was prepared for EA Engineering Services to provide engineering plans to meet NRCS requirements. The execution of this contract required several site visits and a review of EA's proposal for work.

Chandlers Pond Restoration: Following a site visit with local interests and the property owner, a restoration proposal memo was drafted for the dam owner on the South River at Chandlers Pond in Marshfield. No response or further action followed.

Mill River Dam Removal: Communication, including via conference call, was maintained on this project throughout the year and coordination began with Department of Conservation and Recreation, Department of Environmental Protection, and Department of Energy Resources to plan a fish ladder at the Morey's Street Dam at the upstream headwaters in Taunton. USFWS agreed to produce the scoping design for this ladder in FY10.

Shawsheen River Dam Removal Feasibility Study: The ongoing feasibility study for dam removal in the Shawsheen River tributary to the Merrimack River was reviewed and a support letter was drafted.

Martha's Vineyard Site Visit: Following local property owner requests, a site visit was made to investigate potential restoration projects at Trapps Pond, Edgartown and Mill Pond, West Tisbury. A restoration proposal memo was drafted and distributed on the Trapps Pond site.

2009 Trawl Surveys

The 32nd spring and fall surveys were accomplished in 2009 aboard the R/V Gloria Michelle. During the spring survey 101 stations were completed in 17 consecutive days from May 4 – 20. During the fall survey 99 stations were sampled from September 8 – 25 (Figure 6). One hundred five (105) different species of fish and invertebrates were weighed, counted, and measured during the 2009 trawl surveys (Figure 7). To aid cooperative fisheries assessments, project staff collected over 2,000 scale/otolith samples and sex and maturity observations from Atlantic cod, haddock, witch flounder, summer flounder, yellowtail flounder, winter flounder, windowpane flounder, black sea bass, and scup on the spring survey. More than 500 samples were also collected on the 2009 fall survey.

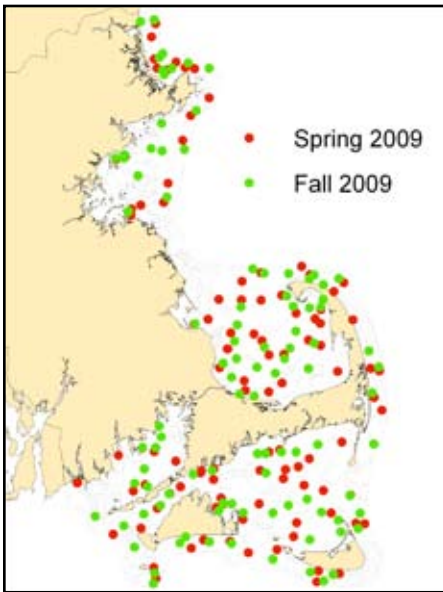


Figure 6. 2009 spring and fall trawl survey station locations.



Figure 7. Project staff sort the catch for sampling.

2009 Seine Survey

The 34th Nantucket Sound Estuarine Winter Flounder Seine Survey was completed from June 18 – July 2, 2009 (Figure 8). The primary objective is to provide a winter flounder YOY abundance index for the Southern New England Stock. Staff count all commercially and recreationally important finfish and invertebrates caught, and note the presence of all species not counted.

The pooled (all estuaries combined) winter flounder YOY index dropped to 0.083 YOY/m² in 2009. This index represents the third lowest in the 34-year time series, surpassed only by lows in 1993 and 2005, and is the ninth consecutive year below the time series median (Figure 9). Interestingly, the trend in the survey's catch of summer flounder YOY is the opposite (Figure 10). Forty-five YOY summer flounder were caught among all estuaries in 2009 representing the third greatest area-wide catch on record and fourth consistently high count.

A total of 44 species were encountered in seine hauls. Smallmouth flounder, *Etropus microstomus*, were recorded for the sixth year in the time series, all in the past decade. This species' range is throughout the Mid-Atlantic Bight, but observations of this small flatfish have increased throughout southern Massachusetts waters in recent years.



Figure 8. Project staff haul in the seine at a site in Eel Pond.

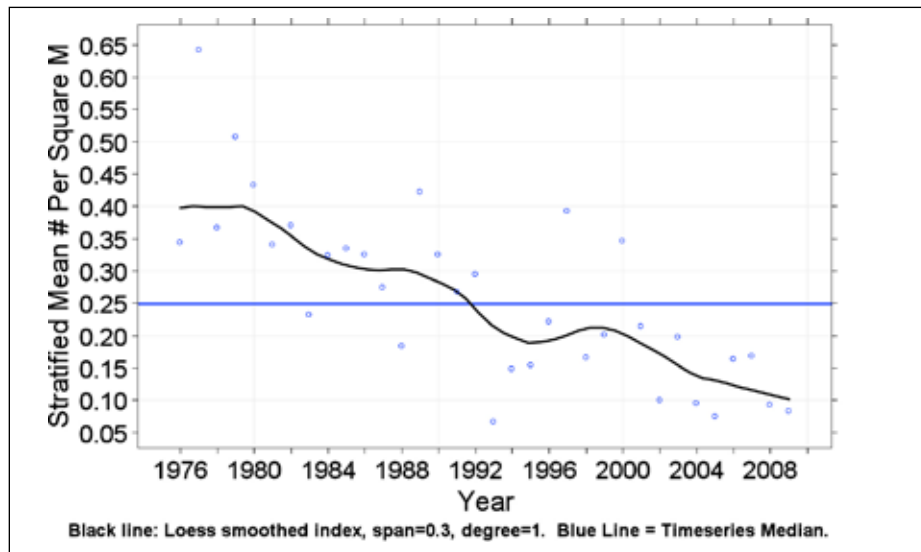


Figure 9. YOY Winter Flounder, *Pseudopleuronectes americanus*, 1976-2009.

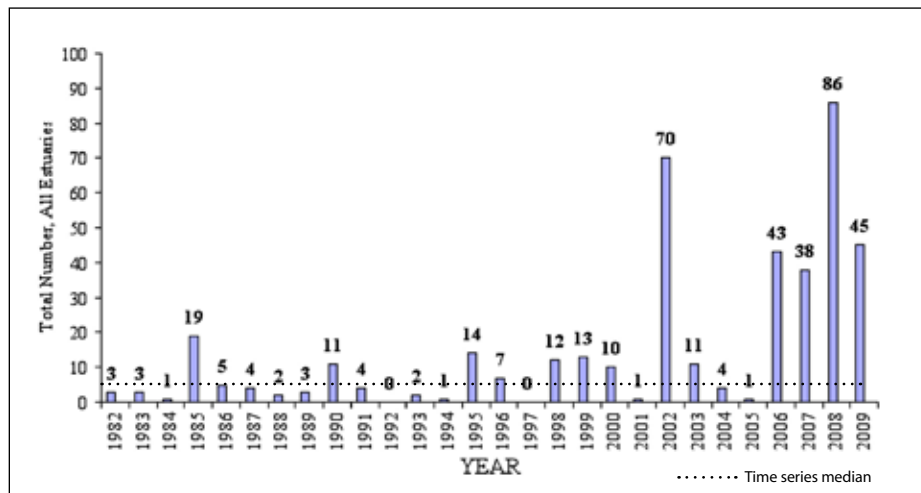


Figure 10. YOY Summer Flounder, *Paralichthys dentatus*, 1982-2009.

Assessment and Fisheries Management Support

Survey data and/or summary graphics were provided to assessment scientists in support of stock assessments and/or compliance reports for numerous ASMFC-managed species including Atlantic herring, black sea bass, bluefish, horseshoe crab, scup, alewife, summer flounder, tautog, weakfish, and winter flounder, as well as state-managed species such as channeled whelk and knobbed whelk.

A summary of Atlantic wolffish catch information along with associated station data was summarized in support of a status review by the Atlantic wolffish biological review team.

The distribution of survey scup catches was summarized in support of the ASMFC Atlantic Coast Fisheries Habitat Program. In addition, smooth dogfish data was provided to NMFS Highly Migratory Species staff for use as source data in Essential Fish Habitat designation.

DMF/MFI Dive Program

Personnel:

Holly Martel Bourbon, Diving Safety Officer

Overview:

The function of the DMF/MFI (Division of *Marine Fisheries*/Marine Fisheries Institute) Diving Program is to safely manage the scientific diving projects conducted under the auspices of *Marine Fisheries*. Currently operated in accordance with OSHA's scientific diving exemption, formal standards for training and dive operations afford *Marine Fisheries* divers better protection from accidental injury and/or illness. Since the Dive Program's inception, diving within *Marine Fisheries* has markedly increased and contemporary diving and risk management procedures are necessary to accommodate this demand.

Dive Program Activities

In 2009, the following projects were supported by *Marine Fisheries* Dive Program staff and *Marine Fisheries* divers:

- Artificial reef monitoring and new site surveys
- Eelgrass restoration and monitoring
- Facility and vessel maintenance
- Finfish behavior, settlement, and relative abundance surveys
- Fishing gear impact and operation
- Ghost gear surveys and removal
- Habitat mapping
- Lobster population dynamics
- Shellfish collection, gear efficiency evaluation, and resource surveys
- Recording temperature instrument and acoustic tag receiver placement and maintenance

During 2009, the following was accomplished within the *Marine Fisheries* Dive Program:

- Dive Safety Officer (DSO) Program Management Activities
 - Dive physicals for staff were scheduled and evaluated.
 - Dive shop and vendor contracts were updated.
 - All Dive Program records were maintained and updated.
 - *Marine Fisheries* dive program and non-diving volunteer waivers were reviewed and updated with Department of Fish and Game (DFG) legal staff.
 - The dive manual rewrite and *Marine Fisheries* Dive Control Board (DCB) reformation were continued.
 - Following a review of program activities and needs, it was decided that the University of Massachusetts/School for Science and Marine Technology (SMAST) diving activities will function independently of the MFI Scientific Diving Program.

- Dive Equipment Maintenance/Acquisition
 - Coordinated, organized, and/or conducted annual inspections or overhauls of all cylinders (50) and diver equipment; acquisition of new gear via purchase and MEP; air system maintenance and management.
- Dive Program Team Training (Figure 1)
 - Recertification of DAN 1st Aid Class (15 people); Advanced class organization, training, and certification (8); Fill Station Operator/Cylinder Handler training; Annual dive skills review for Dive Team; Preparation for all training programs and planning for future (Rescue class).



Figure 1. Annual training pool safety check-out dives.

- DSO/Program Coordinator Professional Development
 - Required update of Instructor certifications (Divers Alert Network, PADI, NAUI, and PSI)
 - Attendance at DSO-related meetings and symposia (AAUS, ADPA, and DEMA). As there was no travel budget, the DSO personally financed her attendance at the scientific diving conference (AAUS) as well as the DEMA/ADPA conferences.
- DSO Collaborations
 - Member of Mystic Aquarium Diving Control Board (since 2008)
 - Northeast REEF Curriculum Coordinator (since 2007)
 - Association of Dive Program Administrators Secretary and Board member (since 2000)
 - Juvenile sand tiger shark project (DSO manages seawater holding system at the Jones River Environmental Center)
 - Help host Boston Sea Rover Scalli Intern and Our World Underwater Scholars with Program Coordinator
 - Attended Bay State Council meetings
 - Booths, presentations and educational programs at local and regional dive shows, schools, museums, and aquaria

The Clean Vessel Act Program

Personnel:

Tom Beaulieu, Program Leader

Stephanie Cunningham, Federal Aid Coordinator

Eileen Feeney, Marine Fisheries Biologist

Overview:

Marine Fisheries administers the Clean Vessel Act (CVA) Program in order to insure that adequate and reasonably available pumpout facilities are provided to meet the needs of recreational boaters using Massachusetts coastal water. This includes the identification of appropriate sites for additional pumpout equipment, readily available technical assistance for both the boater and others in need of information regarding the MassCVA Program, and agency coordination with public and private parties.

In 2009, Marine Fisheries celebrated its 15th year of participation in the Clean Vessel Act Grant Program. Fifteen years ago, few boaters even considered using their holding tanks; now the demand for pumpouts along the fifteen hundred miles of Massachusetts coastline is greater than ever representing an entirely new attitude regarding boaters' personal share of responsibility for clean water.

We continue to remain steadfast in supporting the backbone of our program-participant operation and maintenance funding, inspection protocols, and needs assessment initiatives. All activities are sustained by our strong program administration. With these tools, we continue to build on our program's strengths, tackle new challenges, and form a vision for many more years of clean boating in Massachusetts.

CVA Activities

We work toward providing comprehensive availability of no-cost pumpout service through new infrastructure and funding sub-grantees for operation and maintenance costs. Also, we seek to educate and inform boat owners and operators; federal, state and local governmental authorities and organizations; the environmental community; and the general public, about CVA and the numerous benefits to participating in the Program.

Innovative Ideas, Accomplishments, and Outreach

The geography of the Massachusetts coastline, with its hundreds of bays, coves, and inlets, and our short, intense New England boating season, made it fiscally impossible to site enough fixed shoreside facilities to adequately service the total boating population in the coastal zone. Our innovative program of pumpout vessels (Figure 1) interspersed with shoreside pumpouts and dump stations has created much wider boater access along the coast than twice the number of conventional shoreside facilities could have provided.

We have been a leader in the implementation of pumpout vessel use and sustain this history of innovation by continuing to provide free and convenient pumpout service in all state waters. Providing this type of operator support was one of the key recommendations in the Sport Fish and Boating Partnership Council's (SFBPC) 2008 review of the National CVA Program. MassCVA has been providing this innovative funding since the program's inception.

We are also moving ahead with our preemptive compliance program, capital reinvestment program, and innovative embayments incentive program. In particular, our capital reinvestment program has enabled MassCVA to expand with minimal costs and to the new subgrantees that lack the capital for a full investment in new infrastructure. Through this program, MassCVA pumpout boats and Fixed-Location shoreside stations which are already in service, but replaced



Figure 1. Pump out boat.

by an existing sub-grantee to increase capacity, are not sidelined, they are maintained in the program and placed with a new applicant who will pay to have the equipment refurbished at a fraction of the cost of the new equipment.

The *MassCVA* program has wide participation with public, private, and non-profit Partners. Our subgrantees include 42 private marinas, three non-profit organizations, and 50 cities and towns. Also, we are currently partnering with two federal agencies, three state agencies, one local University, and more than a half dozen non-profit organizations as part of our information and education efforts.

Our successes brought us new challenges. In our 15th Anniversary Year, we were able to jump start our program with new partnerships and a revitalized outreach program that allowed us to connect with new communities and embayments. Our extensive fleet of Pumpout Boats combined with our "Fixed-Location" Pumpout Stations have been instrumental in Massachusetts' efforts to establish a statewide No Discharge Area (NDA).

We also completed our third consecutive year of exhibiting, in partnership with our state boating law enforcement agency, at the New England Boat Show. This has led to record increases in requests for new infrastructure from new operators allowing us to fill long standing gaps in pumpout coverage coastwide and increase awareness of the *MassCVA* Program among boaters and the general public.

As a direct result of our successful outreach and needs assessment efforts to sub-grantees and the general public, program shortfalls are being more effectively identified and addressed. In addition, NDA designations have been approved in 3 new large embayments: Boston Harbor, Cape Cod Bay, and Salem Sound, and new applications have been filed for the remaining Massachusetts coastline. The *MassCVA* Program was proactive in reaching out to communities and private marina operators early in the NDA application process. Consequently, this year's request for new infrastructure (Table 1) has again exceeded expectations and we are also quickly approaching the removal of more than 4 million gallons of effluent from state coastal waters.

Table 1. New Infrastructure for 2009.

The Town of Bourne	New Engine for Pumpout boat
The Town of Harwich	New Pumpout boat
The Town of Salisbury	New Pumpout boat
The Town of West Newbury	New Pumpout boat
Manchester Marine	New Engine for Pumpout boat
Shipyard Quarters Marina	New Fixed Location Pumpout station
Metropolitan Yacht Club	New Fixed Location Pumpout station
Hingham Shipyard	New Fixed Location Pumpout station
Harbor Mooring Service	New Engine for Pumpout boat
Sandwich Marina	New Pumpout boat

The total project costs for the aforementioned Pumpout equipment was \$480,000.00. In addition to this equipment, \$935,867.00 was distributed to 81 sub-grantees to cover the operation and maintenance expenses of 65 pumpout boats and 52 fully functional "Fixed-Location" Pumpout Stations.