Massachusetts Marine Fisheries
2008 Annual Report

MarineFisheries
Commonwealth of Massachusetts

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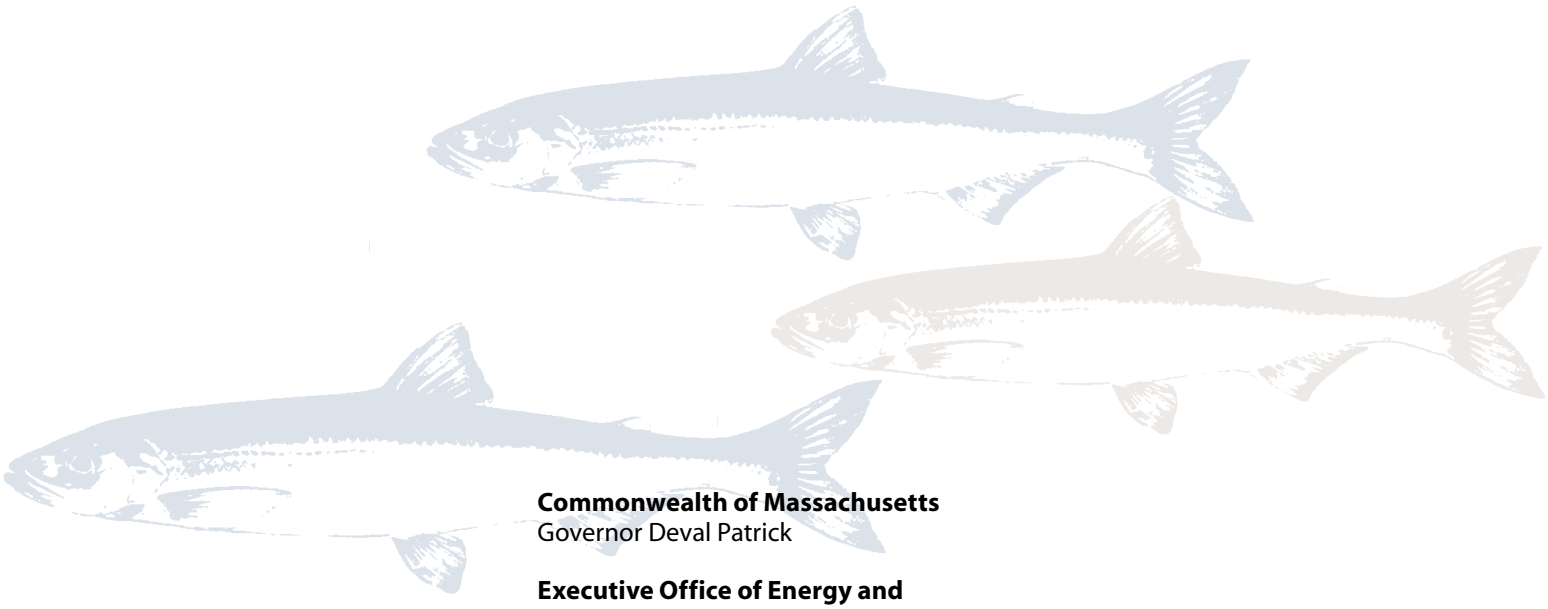

Commonwealth of Massachusetts
Governor Deval Patrick

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, 2008

MarineFisheries
Commonwealth of Massachusetts

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Policy & Fisheries Management

Personnel:

Paul Diodati, Director

David Pierce, Deputy Director

Dan McKiernan, Deputy Director

Kevin Creighton, Chief Financial Officer

Kerry Allard, Permitting Coordinator

Steve Correia, Fisheries Analyst

Dave Borden, Senior Fisheries Management Specialist

Melanie Griffin, Fisheries Management Specialist

Jeanne Hayes, Administrative Support

Shannon Davis, Administrative Support

Jared Silva, Federal Economic Assistance Coordinator

Overview:

Management of marine fisheries unique to state waters and that cross state/federal boundaries is a constant, ongoing endeavor. *MarineFisheries* is the state agency responsible for managing the Commonwealth's commercial and recreational fisheries. A core of fisheries management professionals, with many years of practical experience and knowledge of Massachusetts recreational and commercial fisheries, compose the team that assists the Director with initiating, evaluating, and selecting fisheries management policy and strategies to implement rules and regulations. These rules and regulations frequently result from participation on - and support of - New England Fisheries Management Council *(NEFMC)* 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 agency adherence to administrative and regulatory protocol and procedures. This process also relies on our multitalented scientific/technical staff to provide biological analyses and technical reviews of management options to conserve marine fisheries resources for sustainable fisheries and fisheries habitat protection.

Frequent communications with commercial and recreational fishermen and other facets of these fishing industries is another important element of fisheries policy and management development. This effort directly involves a diverse array of fishermen, dealers, processors and many others in fisheries management.

Public hearings to propose regulations changes are held by the Commonwealth's Marine Fisheries Advisory Commission established by the Legislature in 1961. The Commission and the Department's Commissioner must approve regulatory changes that *MarineFisheries* proposes.

Regulatory Promulgation

MarineFisheries and the Marine Fisheries Advisory Commission conducted seven public hearings in 2008 to implement regulatory changes affecting fisheries for Atlantic bluefin tuna, Bay scallops, blue crabs, multispecies groundfish, horseshoe crabs, river herring, striped bass and fishing by hook gear. Also, *MarineFisheries* hosted nine public hearings on Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan Amendments or Addenda.

Rulemaking changes of note in 2008 included a rule clarifying definitions of adult and seed scallops in response to a request from Nantucket officials; extension of a seasonal cod closure in Massachusetts Bay; three-year extension of the river herring moratorium, ongoing work to revamp pelagic fishery regulations in the inshore net restricted areas and beyond, clarification of tautog potting rules, as well as reduction in the horseshoe crab quota to cap landings near current levels in anticipation of pressure on Massachusetts fisheries, resulting from shortages of crabs in other states.

Striped Bass

In 2008 the Director implemented a pilot program enabling for-hire captains conducting charters to dispose of striped bass racks at-sea. This program was deemed such a success by fishermen, managers and law enforcement that *MarineFisheries* has proposed eliminating the restricting regulatory language (322 CMR 6.07).

Through his authority to condition regulated fishery permits, the Director prohibited bluefin tuna purse seining in Cape Cod Bay. This decision withstood a legal challenge in Superior Court, and was continued into 2009.

Marine Fisheries Advisory Commission

In 2008 Mark Weissman resigned from the Commission and seafood dealer Edward Nasser, was appointed to the Commission.

Groundfish Assistance Program

A 2008 Congressional Appropriations Conference Report provided $13.4-million "to *MarineFisheries* to alleviate economic impacts associated with Framework 42 regulations on the Massachusetts groundfish fishery." Senators Kennedy and Kerry led the effort to ensure these funds were made available to Commonwealth fishermen, along with Congressmen John Tierney, Barney Frank and William Delahunt. *MarineFisheries* developed a two-phase disbursement program, in consultation with members of the fishing industry, Commissioner of the Department of Fish & Game, representatives of the Massachusetts Office of Business Development and the Executive Office of Energy & Environmental Affairs and an economist from the University of Massachusetts at Dartmouth that sought to 1) optimize program benefits, and 2) to make spending decisions in a judicious manner.

Phase 1 of the Relief for Framework 42 allocated the limited monies available for direct subsidy assistance to impacted active fishermen: approximately $500 per eligible "A" Days at Sea to federally permitted groundfishermen. Average payment to individual permit holders was $23,382. Average payment to eligible for-hire vessel owners was $8,222; and a flat payment of approximately $10,000 was made to eligible state-waters-only groundfish fishermen.

Under Phase 2, over 500 crewmembers qualified and received direct subsidies. *MarineFisheries* worked with Shore Support of New Bedford and Gloucester Fisherman's Wives Association (GFWA) of Gloucester, two local non-profits, to assist crewmembers in the process. Phase 2 also included health insurance subsidies for owners, captains and crew. *MarineFisheries* began work in late 2008 with the Massachusetts Fisherman Partnership, an organization with a history of providing health-oriented outreach programs, to develop an application process for the Fishing Partnership Health Plan.

Groundfish Framework 42 Lawsuit

MarineFisheries, represented by the Commonwealth's Attorney Generals Office, continued to be involved in an active lawsuit against the Secretary of Commerce regarding the impacts of Framework 42 to the Federal Fishery Management Plan for Multispecies Groundfish. No ruling was reached in 2008.

Groundfish Amendment 16

MarineFisheries was a strong advocate for the NEFMC slightly delaying its decisions on Amendment 16 to the Groundfish Management Plan. The Plan lacked sound biological analyses. It did not have alternatives based on stock assessment information due in the fall. Bringing the Amendment to hearings without that critical information, including new and revised rebuilding targets, would have created a seriously deficient amendment. *MarineFisheries* concluded the public had to be able to comment on an amendment with clear rebuilding alternatives rather than on a mix of alternatives not based on up-dated science. Good science was needed to explain and defend necessary steps to effectively control fishing mortality while acknowledging and responding to expected socioeconomic impacts.

Groundfish Sector Report

MarineFisheries, through the Department of Fish & Game, contracted Professor Seth Macinko of the University of Rhode Island to analyze and create an advisory report to *MarineFisheries* regarding impacts of imminent changes to multispecies groundfish management in the Commonwealth as a result of quota-based rationalized fisheries management (sector management). Professor Macinko provided an initial draft of the report at the end of 2008.

Recreational Saltwater License

On December 23rd 2008, NOAA Fisheries released a final rule to comply with new provisions of the Magnuson-Stevens Fishery Conservation and Management Act. The final rule requires anglers and spearfishers who fish recreationally in federal ocean waters to be included in the national saltwater angler registry by January 1, 2010.

Prior to issuance of this final rule the Director formed a *Recreational Registry Steering Committee* to provide input on implementation of a Saltwater Angler Registry in Massachusetts waters. Key representatives from various sectors of the Commonwealth's marine recreational fishery were invited to be part of this new committee. The Committee met three times in 2008 and unanimously supported exploration of a state licensing program by *MarineFisheries* that would require the MA legislature to amend Chapter 130 section 17A.

Ocean Plan – Fisheries Workgroup

Governor Deval Patrick signed the Oceans Act of 2008 on May 28, 2008 requiring Massachusetts to develop a first-in-the-nation comprehensive plan "to manage development in its state waters, balancing natural resource preservation with traditional new uses, including renewable energy". To accomplish this planning, the Act created an Ocean Advisory Commission and Ocean Science Advisory Council. The *MarineFisheries*' Director is a Commission member and chairs a Fisheries Workgroup that has identified areas in the Commonwealth's ocean management planning area important to living marine resources, particularly for those that support commercial and recreational fisheries. The Workgroup also collaborated with a Habitat Workgroup to identify habitat areas important to key species and deserving special consideration due to their ecological role or relative scarcity. *MarineFisheries*' staff served on both workgroups as well as on the Ocean Science Advisory Panel with a *MarineFisheries*' scientist Kathryn Ford being co-chair.

Strategic Planning

Work commenced on a *MarineFisheries* 5-year Strategic Plan for 2009-2013. This Plan will come 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 2007 Magnuson-Stevens Reauthorization Act (MSRA) and the Commonwealth's Ocean Management Plan (OMP) scheduled to be promulgated on December 31, 2009 by the Secretary of Energy and Environmental Affairs (EEA). The Oceans Act of 2008 requires an OMP with "comprehensive science-based planning of the Commonwealth's ocean waters to assure long-term protection and sustainable use of a [natural] resource that has been the historical bedrock

of Massachusetts industry and culture." *MarineFisheries*' 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."

Stellwagen Bank Sanctuary

MarineFisheries submitted extensive comments on the Stellwagen Bank National Marine Sanctuary Draft Management Plan with its Action Plans. *MarineFisheries* contributed to the development of the Ecosystem-Based Sanctuary Management (EBSM) Action Plan dealing with issues and actions crossing over to an Ecosystem Alteration Action Plan having two objectives pertinent to *MarineFisheries* and NEFMC fisheries managers: reducing alteration of benthic habitat by mobile fishing and reducing ecological impacts of biomass removal by fishing. Although we congratulated Sanctuary staff for completing their major task after many years of hard work, we emphasized the Draft Plan drew premature conclusions well before action plans were implemented. We recommended the plan had to be reasonable and accommodate stakeholders to ensure their valuable political support.

National Standard #1 Guidelines

Especially relevant to groundfish were *MarineFisheries*' comments on NOAA Fisheries proposed revisions to guidelines for MSRA National Standard # 1 (Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery). We had hoped for flexibility allowing councils to avoid unnecessarily large losses in optimum yield from other "healthy" groundfish stocks in the mixed-stock fishery.

Sea Herring Fishery Monitoring

With the Commonwealth being the epicenter of mid-water trawling for sea herring, as well as mackerel, *MarineFisheries* developed goals and objective for a catch monitoring program to be adopted by the NEFMC in its next amendment to the Atlantic Sea Herring Management Plan. The Council adopted many of our recommendations such as: (1) create a cost-effective, administratively feasible program for provision of accurate and timely records of catch of all species in the sea herring fishery, and (2) develop a program providing catch of herring and bycatch species that will foster support by those to be sampled/monitored and others concerned about accurate accounts of catch and bycatch, i.e., a well-designed, credible program.

Policy Updates

In October of 2008 *MarineFisheries* issued a new policy prohibiting the splitting of Coastal Access Permits (CAPs) from federally-permitted scallop vessels onto a new vessel.

Awards

Dr. David Pierce was presented one of the Atlantic States Marine Fisheries Commission's Annual Awards of Excellence at its 2008 Spring Meeting in Alexandria, Virginia for his contributions to the success of fisheries management & policy.

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:

MarineFisheries has a number of performance requirements that it must meet in order to achieve basic agency 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, affording habitat and fisheries protection through our habitat assessment program, and shepherding the collection and management of fisheries statistics.

Budget: State-Appropriated Funds

The *MarineFisheries* fiscal year 2007 and 2008 appropriations were:

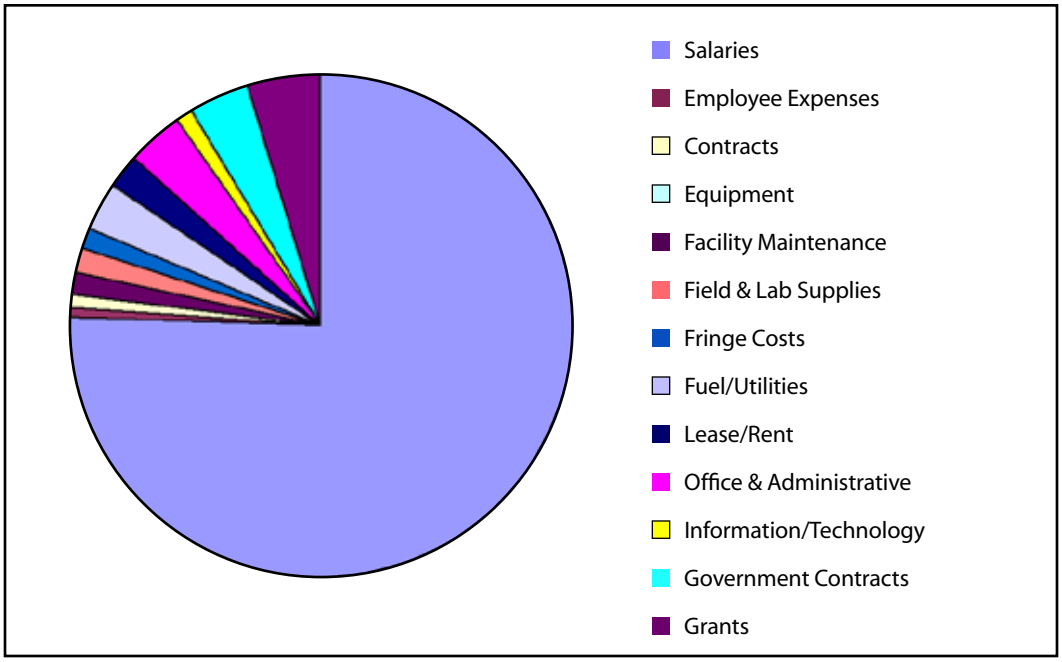
Fiscal Year 20007 and 2008 Appropriations

Title	Acct. Number	FY2007	FY2008	Change
MarineFisheries General Operating	2330-0100	$5,202,112	$4,972,965	-4%
Sport Fish Program	2330-0120	$580,439	$596,905	+3%
Sport Fish Retained Revenue	2330-0121	$217,989	$217,989	0
Total		$6,000,540	$5,787,859	-3.5%

Fiscal Year 2008 Costs, State Appropriations

Account Number	2330-0100	2330-0120	2330-0121
Salaries	$3,780,398.21	$578,103.11	
Employee Expenses	$33,259.65	$2,729.98	$891.35
Contract Employees			$4,830.00
Contracts	$17,939.09		$28,505.97
Equipment			
Facility Maintenance	$31,853.75		$6,899.92
Field & Lab Supplies	$51,072.38	$1,685.48	$36,822.45
Fringe Costs	$71,553.17	$7,688.76	$64.24
Indirect charge ANF			
Fuel	$68,945.23		
Utilities	$118,473.14		
Lease/Rent	$96,830.20		
Maintenance/Repair	$39,792.70		$1,558.00
Office & Administrative	$134,801.10	$1,889.18	$60,025.61
Services/Equipment Lease	$14,903.50	$0.00	$16,950.25
Information/Technology	$56,364.62	$3,858.09	$12,388.60
Government Contracts	$53,607.00	$869.35	$7,020.09
Outside Agencies	$153,635.58		$1,129.95
Grants	$240,000.00		$40,093.41

FY2008 Spending Category Summary



Budget: Federal Assistance and Trust Funds

The *MarineFisheries* fiscal year 2007 and 2008 Federal Grant Awards and expenditures out of the *MarineFisheries*' Trust were:

Fiscal Year 20007 and 2008 Appropriations

Title of Federal Grant or Trust	Acct. Number	FY2007	FY2008
Clean Vessel Act	2330-9222	$850,000	$850,000
Fisheries Statistics	2330-9712	$147,000	$185,000
Right Whale Conservation	2330-9713	$250,000	$250,000
Anadromous Fisheries	2330-9721	$27,000	$27,000
Boating Infrastructure	2330-9725	$100,000	$100,000
Lobster Investigations	2330-9726	$50,000	$50,000
Interstate Fisheries	2330-9730	$233,000	$233,000
Economic Relief	2330-9738	$1,900,000	$100,000
Turtle Disentanglement	2330-9739	$25,000	$25,000
Marine Fisheries Research Trust	2330-0101	$3,250,000	$2,006,000

Staffing

Authorized personnel levels were:

Title	Acct. Number	FY2007	FY2008
MarineFisheries General Operating	2330-0100	63	74
Sport Fish Program	2330-0120	10	10
Federal Grants and Trust Account	2330-xxxx	23	17
Total Employees All Appropriations		**96**	**101**

Revenue: Licensing and Shellfish Fees for 2008

MarineFisheries collects fees primarily from permit issuance and from processing racks of soft-shelled clams at the Shellfish Purification plant. A total of 37,665 permits and endorsements were issued by the Licensing Program producing revenue of $2,111,165 in 2008. This represents a slight decrease in revenue from permit issuance of $45,625 over 2007. The Shellfish Purification Plant in Newburyport processed 13,464 racks of soft-shelled clams in 2008. This resulted in revenues of $80,784, which is an 11% decrease over the 2007 value of $90,528.

Commercial Fishermen Permits

Anyone who lands and sells finfish, shellfish, lobsters, edible crabs, or other living marine resources in Massachusetts must have a *MarineFisheries* 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.

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 (to a licensed dealer) from June 15 - Sept. 15. A maximum of 25 pots may be used. Diving is not permitted, sale of fish and/or shellfish in not permitted.

Boat Permits allows 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 the *MarineFisheries*, and town permit are also required.

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

2008 Commercial Licensing and Revenue Statistics

Permit Type	Number Permits issued		Revenue
	Resident	Non-Resident	
Coastal Lobster	1,325	8	$348,660.00
Offshore Lobster	384	116	$160,160.00
Boat 99'+	15	20	$14,300.00
Boat 60-99'	71	109	$56,355.00
Boat 0-59'	2,674	226	$406,380.00
Student Lobster	117	4	$8,125.00
Individual	315	21	$23,205.00
Shellfish	1,008	17	$41,680.00
Shellfish & Rod & Reel	462	2	$25,670.00
Rod & Reel	710	82	$33,050.00

Dealer Permits

Anyone engaged in the wholesale or retail trade of raw fish, shellfish, lobsters, or bait, whether frozen or unfrozen, must have a *MarineFisheries* Dealer permit and may be subject to inspection from the Department of Public Health. Shellfish dealers must check Food & 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.

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

Retail Boat Seafood Dealer 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 (*see below) must be filed in lieu of a health inspection.

Retail Seafood Dealer 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, relabel or repack shellfish. An approved inspection from the Division of Food and Drugs must be submitted to *MarineFisheries*. 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 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.

Wholesale Seafood Broker 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 (*see below) must be filed in lieu of a health inspection.

Wholesale Seafood Dealer 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 *MarineFisheries*. 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 HACCP plan.

Wholesale Seafood Truck Dealer 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, relabel 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 *MarineFisheries*.

2008 Dealer Licensing and Revenue Statistics

Permit Type	Number Permits issued		Revenue
	Resident	Non-Resident	
Wholesale Dealer	363	8	$49,270.00
Wholesale Truck	83	77	$30,810.00
Wholesale Broker	26		$3,380.00
Retail Dealer	670	4	$44,070.00
Retail Truck	25	3	$2,015.00
Retail Boat	49		$3,185.00
Bait Dealer	134	9	$9,880.00

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 the *MarineFisheries* Abstracts for information on the various types of special permits required.

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 Permit 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 diggers 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 *MarineFisheries* Boston office.

2008 Special Licensing and Revenue Statistics

Permit Type	Number Permits issued		Revenue
	Resident	Non-Resident	
Non-Commercial Lobster	10,764	221	$443,820.00
Regulated Fishery Endorsements	15,351	978	$384,390.00
Master Digger	9		$2,250.00
Subordinate Digger	84		$8,400.00
Scientific Collection	75	22	$1,190.00
"Other" Special Permits	276		$2,760.00
For-Hire Endorsement	690	58	$8,060.00

Shellfish Sanitation and Management Program

J. Michael Hickey, Program Manager

Personnel:

South Shore

David Whittaker: Senior Marine Fisheries Biologist, South Shore Section Leader

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

Newburyport Shellfish Purification Plant

Diane Regan: Laboratory Supervisor

Vivian Kooken/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 in accordance with C.130, s.74 & 74A and the National Shellfish Sanitation

Program (NSSP). The 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 *MarineFisheries* regulation of the commercial surf clam, ocean quahog, and quahog dredge boat fisheries (C. 130, s .52), 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 whelks. Marine Fisheries also regulates shellfish aquaculture and is required by C. 130, s. 57 to certify that operation of private shellfish aquaculture projects at sites licensed by coastal municipalities will not have and adverse impact on shellfish or other natural resources of the city or town. Indirectly, *MarineFisheries* manages through its partnership with the coastal communities by providing technical assistance (C. 130, s, 20, 20A, 21) 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 effect distribution of pollutants, and 3) an assessment of water quality.

Each growing area must have a complete sanitary survey every 12 years, a triennial evaluation every 3 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 5 times a year. In 2008, 7,204 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 growing areas in 16 communities at the same frequency. A total of 2,981 water samples were collected in 2008 and analyzed at the Gloucester *MarineFisheries* laboratory. Coast wide a total of 10,185 water samples were collected from 1,494 stations in 278 shellfish growing areas in 57 communities.

Shellfish program biologists completed 292 annual evaluation reports for growing areas or classification sub-units of growing areas, 51 tri-ennial surveys, 11 sanitary surveys and 9 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 2008, 45 shellfish samples from growing areas were analyzed for bacterial quality, 30 from the South Shore and 15 from the North Shore. Four quahog samples from the Taunton River were tested for metals and PCB's. In addition to these 49 samples, another 837 shellfish samples were tested for red tide (PSP) toxin. A total of 886 shellfish samples were collected and analyzed in 2008.

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. 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 2008, 292 legal notices were written.

During 2008, the Shellfish Program was involved in a number of initiatives designed to improve shellfish classifications. Some of these are ongoing and three resulted in classification changes. On December 8, 2008, *MarineFisheries* was able to reclassify Swan Pond River and a portion of Swan Pond in Dennis, from "Prohibited" to "Conditionally Approved" based on a sanitary survey. Approximately 144 acres were re-opened after being closed for nearly 20 years. The classification change allows seasonal shellfishing between December 1 and April 30. Work on the West Branch of the Westport River resulted in the reclassification of 39 acres from "Conditionally Approved" to "Prohibited" due to deteriorating water quality. A sanitary survey in the Weymouth Fore River resulted in the re-classification of 91 acres south of the Route 3A Bridge to "Conditionally Restricted". This allows the harvest of soft-shell clams for depuration by 20 diggers from this highly productive area for the first time since 1991.

Other work underway involves re-evaluations of the rainfall parameters for closing and opening the Conditionally Approved areas of Essex Bay and Plum Island Sound. It is hoped that areas can be opened more quickly after rain events or that closures can be less frequent based on larger rather than smaller rain amounts triggering closures. A dye study was designed and conducted by *MarineFisheries* North Shore personnel in the Mill River in Newbury to determine the time of travel of effluent from the Governor Dummer Academy waste water treatment facility to shellfish beds down stream. No change in classification resulted from this work but the exercise provided excellent staff training in study design, planning, data plotting and graphing.

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. Monitors were located at eight sites and additional data is being obtained from other sources such as towns and Barnstable County. Temperature data will be used to determine 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 National Pollution Discharge Elimination Permits (NPDES). In 2008, 10 permits including 5 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 *MarineFisheries* 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. In recent years, 2005 and 2008 the intensity, duration and spatial distribution of toxic algal blooms have increased.

The 2008 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 on April 11, 2008 to Blue mussels only. By May 14, 2008, the entire system was closed to all shellfishing and remained closed until mussel harvesting was reopened on June 26, 2008 and

eventually harvesting of all shellfish was allowed on July 2, 2008 with the exception of Salt Pond in Eastham that remained closed until July 23, 2008.

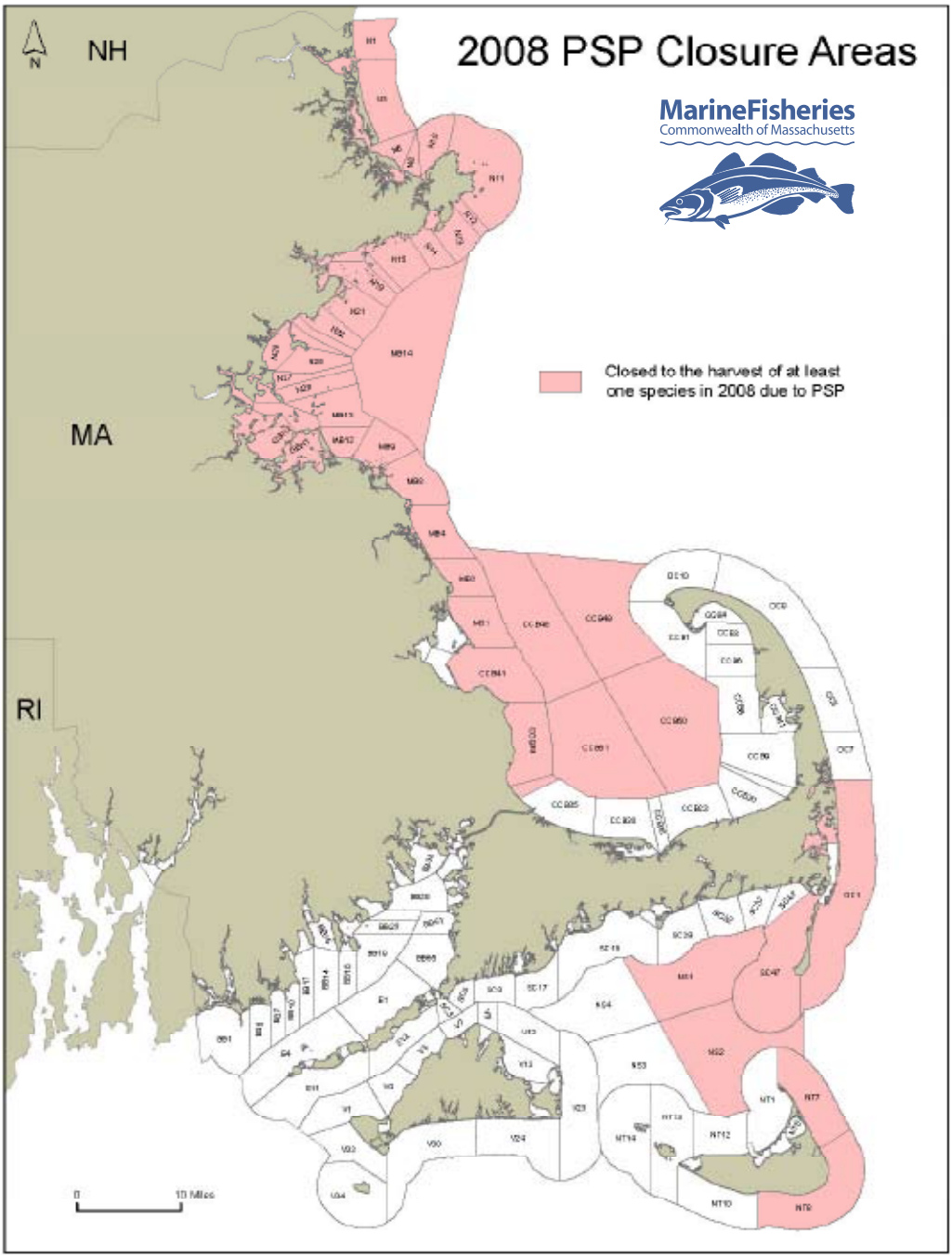
Climatic conditions in the spring and early summer of 2008 in combination with a large and continual bloom of *Alexandrium fundyense* off the mid-coast of Maine (originating from extensive deepwater cyst beds) led to an expansive red tide event impacting the entire North Shore, Boston Harbor, South Shore, Pleasant Bay, the outer coastal areas of Cape Cod from Nauset Inlet in Eastham to Chatham including all of Monomoy Island, the eastern half of Nantucket Sound and the outer Nantucket East and Southeast coastal areas. The first closure on the North Shore occurred on May 15, 2008 from New Hampshire to the Gloucester-Manchester line. Eventually, much of the coast was closed on May 22, 2008 from New Hampshire to the Bourne-Sandwich town line except for the Plymouth/ Kingston/ Duxbury Bay complex. Boston Harbor was closed on June 12, 2008 due to red tide for the first time in 37 years and remained closed until July 10, 2008. By June 26, 2008 at the maximum extent of the bloom, approximately 777,842 acres of shellfish area including offshore Surf clam beds were closed (Figure 1). In addition to the closure of state waters, *MarineFisheries* ordered a prohibition on landings of all shellfish and carnivorous snails (with the exception of adductor muscle of the sea scallop) coming from federal waters directly adjacent to the Commonwealth. This prohibition lasted from June 20, 2008 through July 9, 2008. The first reopening on the North Shore was June 29, 2008 in Essex Bay followed by Plum Island Sound and Annisquam River on June 12, 2008. Openings proceeded by area and species until most areas were open to all bivalve shellfish by August 21, 2008 while surf clams on the South Shore remained closed until October 15, 2008.

The closures affected 39 coastal communities, 29 of which have commercial harvesting. Primary industry participants directly affected by red tide-related closures include commercial shellfishermen, wholesale dealers, and aquaculturists. *MarineFisheries* estimates the closures affected approximately 400 full and part-time commercial fishermen, 35 aquaculturists in Eastham, Ipswich, Orleans and Rowley as well as the Ocean quahog, Surf clam and Sea scallop fisheries. This resulted in a determination by the Secretary of Commerce (under the Magnuson-Stevens Fishery Conservation and Management Act) of a fishery resource disaster from the red tide. Consequently, $2,000,000.00 was awarded to the Commonwealth of Massachusetts and the states of Maine and New Hampshire for industry relief. *MarineFisheries* used the funds for Lost Income Subsidy (LIS) to compensate fishermen ($1.2 million) and $800,000.00 for Technical Assistance to increase monitoring capacity, expand community outreach and subsidize the Massachusetts share of the cost of an *Alexandrium* cyst bed mapping program conducted by Woods Hole Oceanographic Institution (WHOI) and similarly supported by Maine and New Hampshire. The goal of the Technical Assistance funds is to minimize the impacts of future blooms by giving *MarineFisheries* the tools to enact more accurate and surgical closures, as well as to promote consumer confidence.

A total of 837 shellfish samples were collected and tested for PSP during 2008. The samples support three activities: monitoring in state waters, including some in adjacent federal waters (762 samples); a pilot dockside monitoring program (39 surf clam samples); and a federally-funded scallop industry study (36 sea scallop roe/viscera samples). In addition, during this same time period, 126 phytoplankton samples were collected and analyzed by several area biologists. 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 and Diarrhetic Shellfish Poisoning (DSP) and Amnesic Shellfish Poisoning (ASP). Shellfish staff investigated a bloom that produced large patches of red water in the upper parts of Buzzards Bay in August and early September caused by the non toxic phytoplankton *Cochlodinium sp*.

During 2008, 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,



Shellfisheries Management

Contaminated Shellfish Resources

MarineFisheries directly manages contaminated shellfish resources for depuration, relaying to harvestable areas, and bait harvest.

Contaminated Relays

MarineFisheries 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 2008, thirteen (13) towns participated in the program moving a total of 8,625 bushels of quahogs, 8,338 from the Taunton River and 287 from the Bumps River in Barnstable to 23 locations and 108 bushels of oysters within Sippican Harbor in Marion under 15 Contaminated Relay Permits. This method of shellfish propagation affords participating municipalities a relatively inexpensive source of shellfish to use as parent stock and also allows eventual utilization of the contaminated resource thus eliminating the temptation of illegal harvesting by removing the stock from contaminated areas.

Contaminated Bait

Currently, the only contaminated shellfishery for bait is the heavily regulated, occasional surf clam dredge boat fishery. Recent activity has been limited to landings of 57,969 pounds live weight by 2 fishermen from prohibited areas of Nantasket Beach in Hull, amounting to 6,441 bushels.

Depuration

The management and oversight of mildly contaminated soft-shell clams is a substantial activity for *MarineFisheries*. Clams are harvested from specially designated, "Conditionally Restricted" areas in Boston Harbor, Pines River and the Merrimac River and transported by *MarineFisheries* 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 units. Pure seawater is obtained from two deep salt water wells and is continuously disinfected using ultra-violet 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 clams on a total of 164 days (runs) from 34 areas (Table 1). A total of 13,464 racks/50 pound bushels of soft-shell clams were received (Table 2). Fifty-eight racks were seized and destroyed having been harvested at the beginning of a red tide closure in the Pines River. The 13,406 racks processed and released generated $80,436.00 in rack fees.

Table 1. Plant Operations

No. of Runs	164
No. of Lots	490
No. of Recalls	0
Seized	1

Revere/Saugus was the top producing area and supplied the plant with 32% of all racks processed, followed by Quincy (18%) and Winthrop (16%) (Table 2). The highest daily average by municipality was again Revere/Saugus, with Boston and Winthrop a distant second and third. Hingham delivered 11% of all clams to the plant, followed by Hull at 7%, Boston with 6%, and Newburyport and Weymouth were tied with 4% each.

Table 2. Plant Production by Municipality

City/Town	Racks	Days	Average Day	Percent of Production
Boston	772	29	27	6%
Hingham	1528	64	24	11%
Hull	1006	50	20	7%
Quincy	2476	150	17	18%
Weymouth	597	35	17	4%
Winthrop	2175	85	26	16%
Newburyport	586	31	19	4%
Reverv-Saugus	4324	46	94	32%
Total	13464	490		

Production came from greater Boston Harbor, the Pines River, and the Merrimack River. Almost twice as many clams were harvested in Boston Harbor 64%, as the Pines River at 32%, and followed last by the Merrimack River (Newburyport) with 4% (Table 3).

Table 3. Plant Production by Waterbody

Waterbody	Racks	Percent Racks
Boston Harbor	8554	64%
Pines River	4324	32%
Merrimack River	586	4%
Total	13464	

Table 4. Plant Production by Digging Group

Digging Group	Racks	Days	Percent Racks
Boston	7271	160	54%
Quincy	2476	150	18%
South Shore	3131	149	23%
Newburyport	586	31	4%
Total	13464		

Except for the Merrimack River (Newburyport), all harvesting was divided among three digging groups; Boston diggers (digging Boston, Revere, Saugus and Winthrop), Quincy diggers, and South Shore diggers (digging Hingham, Hull and Weymouth). Boston diggers accounted for 54% of all shellfish processed by the plant (Table 4), followed by the South Shore diggers in the Hingham, Hull and Weymouth collectively with 23%, then Quincy 18%, and Newburyport at 4%.

Table 5, on the next page, breaks down harvest by individual area. Once again Revere/Saugus produced the most, supplying 32% of all clams to the plant. The next most productive area was Winthrop with 10% and Hingham Harbor with 8%. Hingham Harbor and Pines River in Revere/Saugus were both harvested on 46 days, the most number of days of any "Conditionally Restricted" areas. Winthrop was the third most harvested area at 40 days, followed by Newburyport with 31 diggings days and Quincy, 0 days.

Plant Laboratory

The Shellfish Purification Plant received $235,000 in capital funds for three projects; 1) Lab Renovations $160,000; 2) New Furnace and Ducts $50,000; 3) Plant Foundation, Floor and Dock Repairs $25,000. With $160,000 of state-approved capital funds, the laboratory was completely renovated in 2008. Diane Regan, Bacteriologist III, designed the lab with a representative from Gibson Labs. The lab was "gutted to the studs", new electrical wiring was installed, as well as phone and data cables. New plumbing and gas lines were installed to code. Epoxy flooring was installed along with new wallboard. Finally, the new cabinets, countertop, and equipment were installed. Ralph Stevens, Plant Foreman, supervised the general contractor throughout the process and the renovation was completed on budget.

The plant received shellfish on 164 days (runs) and processed 490 lots of shellfish. One lot was seized as harvested on the first day of a PSP closure. In total, the lab ran 1091 shellfish samples and 1197 water samples during calendar 2008.

Department of Public Health Inspectors continued monthly inspections throughout the year. Plant laborers participated in the SERV Program and several school tours were provided. As usual, the plant remained staffed for all state holidays except for Christmas day.

Boston Harbor Soft-shell Clam Enhancement

In 2008, *MarineFisheries* and its partners (local municipalities, commercial shellfishers, and Salem State Northeast Massachusetts Aquaculture Center) were able to seed 42 plots with 756,000 seed clams at four enhancement sites, two in Hingham and one each in Winthrop and Weymouth. Additional seeding at these locations and also at Hull and Quincy was suspended thereafter due to the presence of an ectoparasite believed to be *Boonea spp*. found during routine pathology tests of juvenile clams from Salem State's hatchery/grow out facility. Since little is known about the life history and distribution of this tiny gastropod commonly termed the Siphon snail in Massachusetts waters and because *Boonea* has been implicated in the

Table 5. Plant Production by Shellfish Classification Area

City/Town	Area	Racks	Days	Percent of Production
Boston	GBH 3.6	29	1	0%
Boston	GBH 3.9	254	8	2%
Boston	GBH 3.10	70	2	1%
Boston	GBH 5.3	68	2	1%
Boston	GBH 5.4	351	16	3%
Hingham	GBH 1.7	280	11	2%
Hingham	GBH 1.8	1088	46	8%
Hingham	GBH 1.9	17	1	0%
Hingham	GBH 1.11	25	1	0%
Hingham	GBH 1.14	118	5	1%
Hull	GBH 1.1	76	4	1%
Hull	GBH 1.2	455	23	3%
Hull	GBH 1.3	249	12	2%
Hull	GBH 1.4	30	2	0%
Hull	GBH 1.5	196	9	1%
Quincy	GBH 1.23	690	30	5%
Quincy	GBH 1.25	274	18	2%
Quincy	GBH 1.26	139	10	1%
Quincy	GBH 1.27	45	4	0%
Quincy	GBH 2.1	255	17	2%
Quincy	GBH 2.2	89	6	1%
Quincy	GBH 2.4	341	25	3%
Quincy	GBH 2.5	385	27	3%
Quincy	GBH 3.2	258	13	2%
Weymouth	GBH 1.10	38	3	0%
Weymouth	GBH 1.13	305	17	2%
Weymouth	GBH 1.20	16	1	0%
Weymouth	GBH 1.21	66	2	0%
Weymouth	GBH 1.29	172	12	1%
Winthrop	GBH 5.1	297	18	2%
Winthrop	GBH 5.2	1303	40	10%
Winthrop	GBH 5.5	575	27	4%
Newburyport	N2.1	586	31	4%
Revere-Saugus	N26.1	4324	46	32%
Total		13464		

spread of shellfish diseases along the mid- and south Atlantic coasts, *MarineFisheries* temporarily restricted any further transplanting of clams from Salem State's Cat Cove hatchery facility pending further investigation. Subsequent testing ruled out *Boonea* and found no evidence of any infestation.

The 2008 enhancement plots were regularly monitored through the growing season and will be sampled during spring 2009 to determine clam growth and survival.

Technical Assistance

In Massachusetts, the cities and towns manage the shellfisheries in all waters within their boundaries that are not closed by *MarineFisheries* 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 and aquaculture development and regulation. Each shellfish biologist and the program supervisor provide technical assistance to municipalities, 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 1,500 separate occasions to more than 100 entities.

A major technical assistance activity dealt with re-evaluating the legal definition of a "seed" or immature bay scallops as a result of an extraordinary set of conditions on Nantucket. Bay scallop fisheries are managed based on harvest of only adults with a raised annual growth line on their shell. Usually this line lies 1.2 to 1.6 inches from the hinge. *MarineFisheries* policy based on long standing scientific work of Dr. David Belding, a pre-eminent shellfish biologist has been that the line must be at least 3/8 "(10 mm) from the hinge, otherwise it is considered "seed". An exceptional late spawn of bay scallops in the fall of 2007 produced an abundance of scallops in 2008 that were in their second year, but the growth line was very close to the hinge, less than 10mm.

Locally known as "nubs" these scallops resemble large seed scallops. In November 2008, over 85 % of the scallops available in Nantucket waters were nubs. Nantucket shellfish officials worked diligently to estimate standing stock and estimate reproductive status while conferring with the Shellfish Program Chief Biologist. They petitioned *MarineFisheries* to create a more refined rule that would protect seed scallops, but allow the harvest of some nubs with a line less than 10 mm from the hinge if the scallop measured 2.5 inches shell height from the hinge. This strategy allowed harvest of 43% of nubs and protected 57% of the smaller nubs. This allowed for a three-fold harvest. The Shellfish Program continues to work with the Town of Nantucket monitoring the scallop population.

Other assistance was provided to the Town of Wellfleet, the Nature Conservancy and the Massachusetts Audubon Society regarding an oyster restoration program in Wellfleet Harbor and the Massachusetts Oyster Project related to oyster restoration in Boston Harbor.

Environmental Protection

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. These events include sewage discharges, boat sinkings, petrochemical spills and other discharges of hazardous chemicals.

In addition, the Shellfish Program co-reviews with other *MarineFisheries* staff, various proposed coastal alteration projects with regard to impacts on water quality, shellfish resources, and shellfish habitat. Recommendations are made through the *MarineFisheries* environmental review process to the permitting agencies concerning the effects of proposed structures, filling or discharges into the marine environment. In 2008, approximately 216 proposed projects were reviewed ranging from private docks to large projects such as the Weaver Cove LNG terminal in Fall River and the Cape Wind proposal in Nantucket Sound.

Aquaculture Management

A major management and technical assistance endeavor of the Shellfish Program is the regulation of shellfish aquaculture. This activity involves 2 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. *MarineFisheries* 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 *MarineFisheries* 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 2008, 17 new private aquaculture license sites in 8 towns totaling 17.75 acres were surveyed and the sites approved. In addition, aquaculture permits (also known as propagation permits) were issued to 300 license site holders operating shellfish aquaculture projects on 368 sites totaling 952 acres in 26 coastal towns. The 2007 value of shellfish marketed by growers, as reported in 2008, was $6,181,000.00 based on average wholesale price. 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 *MarineFisheries* denial, and assisting growers in finding seed sources and working with hatcheries to become certified to sell seed in Massachusetts. An aquaculture annual report is prepared describing marine aquaculture activities. A list of *approved* shellfish hatcheries is maintained on the *MarineFisheries* website.

Surf Clam and Quahog Dredge Fisheries

Fourteen vessels landed 81,767 bushels of surf clams (7,359,032 pounds live weight) worth $1,512,689.50 at landing from Massachusetts waters while 24,065 bushels of northern quahogs (1,684,572 pounds) worth $1,395,788.50 was landed by 15 vessels.

Other Activities

The Shellfish Program continues to participate in the activities of the Interstate Shellfish Sanitation Conference (ISSC). ISSC is the primary agency involved in setting standards for the NSSP that regulates shellfish sanitation. The Program Chief is Chairman of the Executive Board and also chairs or is a member of six committees.

Program staff participates in professional organizations such as the Northeast Shellfish Sanitation Association (NESSA) and the Massachusetts Shellfish Officers Association (MSOA). In addition, the laboratory staff participates in training and workshops of the Northeast Laboratory Evaluation Officers and Managers (NELEOM) funded by FDA.

Susan Boehler is the only U. S. FDA certified Laboratory Evaluation Officer (LEO) in Massachusetts with responsibility for evaluating all laboratories involved in bacteriological analysis of water or shellfish acceptable to the NSSP and ISSC. This involves 2 *MarineFisheries* labs, 1 MWRA lab, a City of New Bedford lab, and a single industry lab.

The Supervisor 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 involving a proposal to introduce the Asian oyster, *Crassostera ariakensis* into Chesapeake Bay. ASMFC recommended against the planned introduction.

During 2008, the *MarineFisheries* Shellfish habitat maps were updated. Shellfish staff initiated the update of Shellfish Classification Maps with the assistance of Julian Race.

Program staff, principally Neil Churchill, participate in near monthly meetings with the U.S. Coast Guard, NOAA and DEP relative to oil and hazardous materials spill contingency planning and drills.

Habitat Project

Personnel:

Kathryn Ford, Project Leader

Frank Germano, Senior Marine Fisheries Biologist

Tay Evans, Marine Fisheries Biologist

Vin Malkoski, Senior Marine Fisheries Biologist

Eileen Feeney, Marine Fisheries Biologist

Mark Rousseau, Marine Fisheries Biologist

Steve Voss, Fisheries Technician

Overview:

The *MarineFisheries* Habitat Program was created in response to the need to comprehensively understand and assess impacts to marine fisheries habitat. Its purpose is to provide science-based technical review of coastal and marine alteration projects; initiate and perform fisheries habitat research and applied studies; and provide technical guidance on both the status of, and potential impacts to fisheries resources and habitats of the Commonwealth, including creating and disseminating marine fisheries guidance documents and regional resource information for Massachusetts. The Habitat Program provides invaluable input to the marine alteration project review process resulting in significant guidance to other agencies and jurisdictions in evaluating potential impacts from proposed construction projects.

In 2008, 669 projects were reviewed and considerable progress was made on improving access to coastal data to improve reviews, updating habitat datasets, and improving communications with other *MarineFisheries* staff and other agencies. Ocean planning required significant staff time. All personnel actively engaged in field work, including reef sampling, PCB sampling, two cruises deploying the Focus towed-underwater vehicle, SeagrassNet (four sampling periods per year), and support for other projects including the trawl and ventless lobster surveys.

Technical Review Project

The *Technical Review* team tracks coastal and marine construction projects, solicits specific resource information from *MarineFisheries* biologists, writes project comment letters, reviews options for compensatory mitigation and participates in interagency meetings. Technical Review also undertakes directed research such as updates to time of year recommendations and the development of best management practices.

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); 669 specific projects were reviewed. We rely heavily on the expertise and support from almost all *MarineFisheries* staff. Management and prioritization of the volume of requests is of primary importance. New filers were hired in both field offices on a contract basis. These appointments allowed greater consistency in logging and responding to reviews. Improving/maintaining communication with a highly diverse pool of colleagues is a constant effort.

Major review projects, i.e., those that had multiple steps in the permitting process, typically involved multiple meetings, workgroups, and interagency communications, and which, due to their complexity, took large amounts of time to review and comment on, included: the Weaver's Cove LNG Terminal proposal in Fall River, Hull Wind Farm, Great Harbor Dredging, HubLine permit

post-construction mitigation requirements, Cape Wind, Ellisville Salt Marsh, Boston Harbor Deep Draft, Stellwagen Bank Draft Management Plan, Salem Port expansion.

Time of Year Work Windows

We responded to eight Cape town letters, the State dredging team, and the Regional dredging team regarding the use of environmental "windows" to minimize impact of dredging on marine resources. Participation in a working group with town representatives is on-going and several presentations to the dredging teams regarding time of year work windows have been made. A technical report is in preparation which will link life history information with time of year recommendations.

Fisheries Habitat Research Project

The goals of *Fisheries Habitat Research* include better consolidation of existing habitat research within *MarineFisheries* and using it to inform management. This program also aids in the creation of new data products now viewed as necessary in the fisheries management community (e.g. seafloor maps).

The *MarineFisheries'* Focus-2 Towed Underwater Monitoring Vehicle (TUV); has fiber optic communications cable and is capable of carrying and transmitting information from multiple environmental monitoring devices simultaneously, including sonar, optical, and water quality sensors, and can be towed at specified water depths in horizontal or undulating patterns.

Buzzards Bay/Sediment Geodatabase

Existing data were combined and analyzed, providing crucial insight regarding mapping seafloor features in Buzzards Bay and for the whole state as part of the Ocean Management Plan. Also, considerable progress was made combining sediment data statewide utilizing *MarineFisheries*, USGS, EPA, and MWRA data sources. It is anticipated that the final product will be produced as a technical report and be included in ocean planning products.

In Lieu Fee Program

MarineFisheries worked with the Army Corps of Engineers (ACOE) and the Department of Fish and Game to create an "In lieu fees" program for mitigation of impacts from marine construction. Mitigation may be required of proponents when projects unavoidably and adversely will impact an area's capacity to provide ecological services (e.g., shelter, forage, and spawning habitat). Fees for expected impacts to the marine environment and resources were defined and documented, and all administrative components were established. The program subsequently received its first funds and a technical report detailing the program and how the fees were defined is in preparation. A science advisory group will be assembled to determine how to spend the funds.

PCB Sampling Program

PCB sampling in marine biota off New Bedford was conducted according to pre-established protocols. Reports were submitted as required.

SeagrassNet

We participate quarterly in SeagrassNet using divers to monitor an eelgrass bed in Salem Sound according to international protocols designed to assess regional changes in seagrass health. This project is new in 2008 and has involved cross-project coordination of staff. In response to a statewide need to have a strong network of seagrass experts, *MarineFisheries* is coordinating a group to maintain and improve communications.

Technical Guidance

Technical Guidance has two key objectives: 1) to improve the dissemination of resource information and 2) to guide the development of *MarineFisheries* policy documents.

Ocean Management Planning

The Project supervisor participated in the Ocean Management Planning initiative including habitat and fisheries workgroups, baseline assessment, ecological valuation index subgroup, and interagency subgroup. Other Project staff helped assemble data, write and review portions of the Baseline Assessment report. There will be products resulting from these efforts that will fully support our review of marine offshore construction projects.

Artificial Reef Policy

This Artificial Reef Policy report was finalized, printed, and linked on the *MarineFisheries* website.

Eelgrass Sampling Standards

A set of standards for eelgrass restoration was drafted in response to the growing number of eelgrass restoration projects proposed for Massachusetts coastal waters.

Improving Access to Shellfish Data

In an attempt to improve access to *MarineFisheries'* archived and current shellfish data, two projects were designed: 1) updating suitability maps for shellfish on MassGIS and 2) posting sanitary surveys on the intranet. Maps were uploaded to MassGIS. The sanitary surveys provide current status and, in many cases, history of every waterbody in Massachusetts, but reside on files on personal computers. Access to them is being improved through their relocation to the *MarineFisheries* internal web site.

Outreach

Outreach was accomplished in a variety of events including manning booths at Salem Sound Coastwatch Swim and Fin Event, the Mass Association of Conservation Commissioners annual meeting and the Boston Sea Rovers annual meeting; presenting at Women in Science and Engineering, local schools, and the Rhode Island Natural History Survey.

Invertebrate Fisheries Project

Personnel:

Robert Glenn, Project 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

Overview:

The Invertebrate Fisheries Program focuses on research and monitoring of American lobster, Horseshoe crab, and Northern Shrimp to provide pertinent data to enhance the species management process. The primary monitoring programs for American lobster, including commercial sea-sampling, the ventless trap survey, and early benthic phase lobster suction sampling were all completed as scheduled. The spawning beach survey and other fisheries monitoring for Horseshoe crabs and annual participation in the Northern Shrimp survey were completed as scheduled. Research grant writing and administering and participation in ASMFC fisheries management and stock assessment meetings for key invertebrate species are ongoing tasks.

Commercial Lobster Trap Sampling

The 28th year of the Commercial Lobster Trap Sampling Program was completed. This is an ongoing cooperative effort conducted with MA commercial lobster fishermen dating back to 1981. A total of 93 trips were conducted in which 44,060 lobsters were sampled from 18,469 trap hauls. All data entry from all regions was completed.

Commercial lobster sea sampling in Buzzards Bay, MA.

The program was expanded in 2008 to include sampling out of the port of Provincetown. Project personnel will perform a detailed analysis to compare the data collected out of Provincetown with data from Cape Cod Bay and other Outer Cape Cod ports to determine if the disposition of the catch in these areas is substantially different and if continued sampling in Provincetown is warranted.

An analysis was conducted of potential impacts to fishermen income in the Outer Cape Cod lobster fishery as a result of rule changes proposed by NMFS. Sea sampling, landings, and price data from the Outer Cape region from 2002 to present were analyzed to evaluate catch weight and price losses based on the proposed new v-notching definitions and the addition of a maximum gauge size.

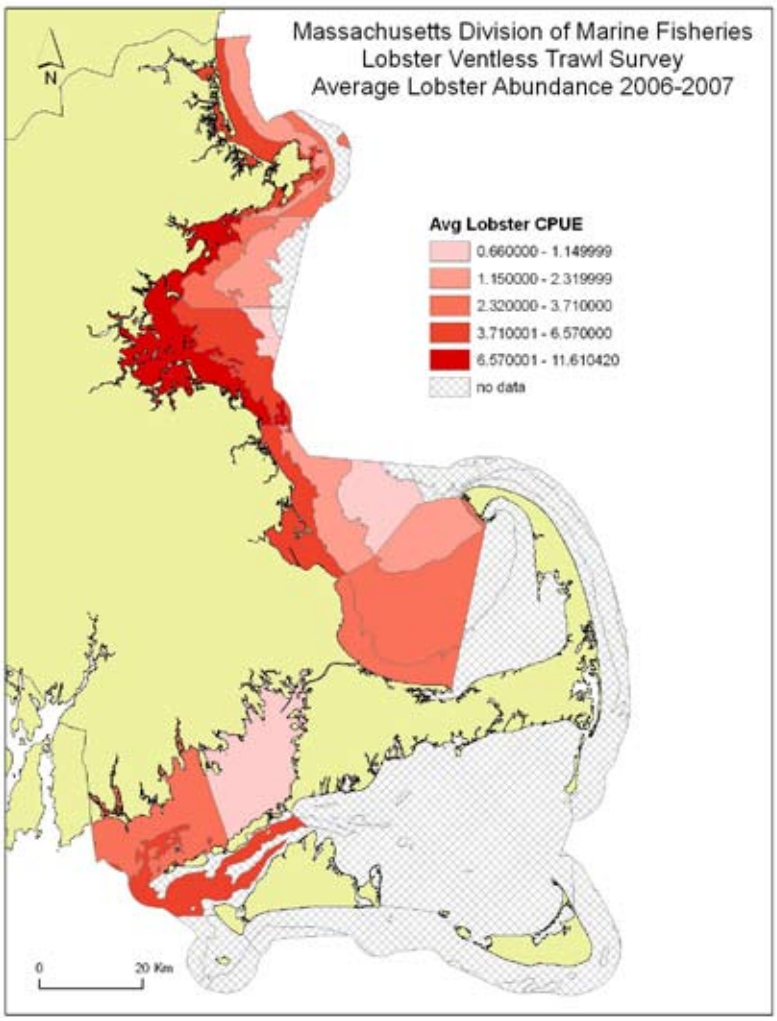
Data from the commercial trap sampling program contributed to the ASMFC lobster stock assessment analyses and the bi-annual *MarineFisheries* lobster status of the stock report. Data specific to the Boston Harbor region were also provided to the HubLine Program coordinator for incorporation into the HubLine final report.

Ventless Lobster Trap Survey

The 3rd year of the ASMFC-funded Coastwide Ventless Lobster Trap Survey was completed in 2008. The use of ventless gear extends lobster size structure information to the smaller sizes that do not normally occur in commercially-deployed vented traps. Sixty sampling stations in the southern Gulf of Maine and 24 stations off the southern Massachusetts coast were sampled semi-monthly from June through September. Trap placement was stratified by bottom type and bathymetry. Staff made a total of 56 trips sampling 16,959 lobsters from 3,746 trap hauls.

A robust standardized analysis methodology for the ventless trap survey was developed and will be presented to other Lobster Technical Committee states deploying this survey technique.

A map of coastal Massachusetts showing depth strata rankings based on ventless trap survey lobster CPUE data from two survey years was provided to the Fisheries Working Group of the Ocean Management Planning Taskforce (Figure 1).



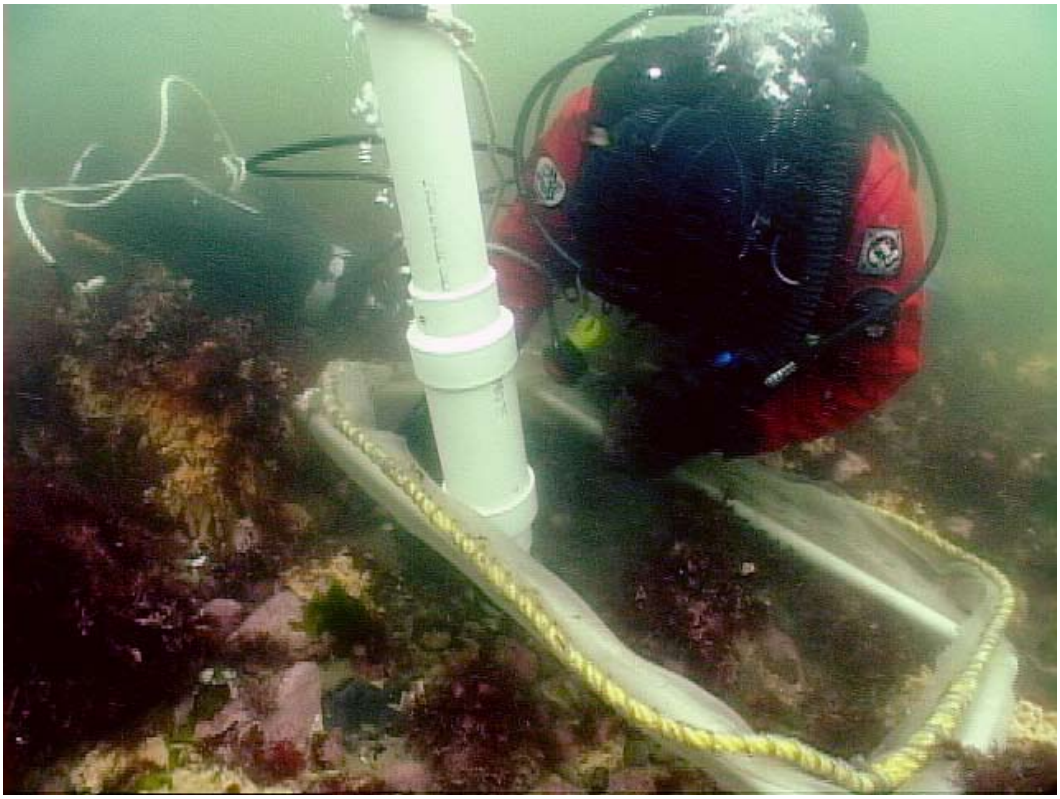
Depth strata rankings based on ventless trap survey lobster CPUE.

Lobster Port Sampling

Our third season of port-sampling the offshore lobster fleet was completed. A total of 6 trips were conducted on vessels fishing in the Offshore Gulf of Maine (NMFS stat. area 515), and 8 trips from boats fishing on Georges Bank (NMFS stat. area 562). Data from 2006 and 2007 were provided to ASMFC for inclusion into 2009 lobster stock assessment. Two semi-annual progress reports detailing this work were submitted to ASMFC to satisfy reporting requirements for the ACFCMA grant that supports this work.

Lobster Stock Assessment

Staff participated in multiple ASMFC Lobster Stock Assessment committee meetings to generate the 2008 ASMFC Lobster Stock Assessment. Work for the assessment included: preparation and submission of fisheries dependent and independent lobster data, inputting data to population dynamics models, reviewing model results, drafting stock assessment report sections, assisting the committee with stock status determination, and report reviewing.



Diver deploying lobster EBP lobster suction sampling equipment in cobble habitat.

Annual Early-Benthic-Phase Lobster Suction Sampling

The 14th 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 7 days from mid-August to mid-September. Re-sampling of several sites in Cape Cod Bay and Boston Harbor was conducted on 2 days in October to confirm low counts 2008.

Annual Boston Harbor Artificial Reef Monitoring

The third year of annual sampling on the HubLine artificial reef was completed. Monitoring components include transect surveys and suction sampling on both reef and reference sites (natural cobble reef, HubLine cobble fill, and sand). Transect surveys were conducted over 7 days in June and July using quadrat, swath bar, and photographic sampling techniques.

Northern Shrimp Survey and Assessment

Project staff participated in one-week legs of the annual northern shrimp survey aboard the R/V Gloria Michelle conducted in July and August throughout the Gulf of Maine and the 2008 stock assessment.

Horseshoe Crab Monitoring

Horseshoe crabs congregating on a spawning beach.

An expanded volunteer-based survey of horseshoe crab spawning beaches was completed in 2008. Twenty-five spawning beach surveys were completed with the help of a total of 180 volunteers and staff from 13 agencies. Increased coverage is planned for 2009 through the enlistment of more volunteers.

A regional technical committee was formed with representatives from 10 federal, state, and non-profit agencies and 3 universities in an effort to improve data collection on horseshoe crab populations. This committee developed plans for a standardized survey of spawning beaches in MA, RI, and CT, which was modeled after surveys conducted in the Delaware Bay since 1999.

A tagging study, spurred by concerns about skewed spawning sex ratios, was initiated in Pleasant Bay. The study was designed to ascertain whether re-capture rates of bled females (crabs bled for pharmaceutical purposes by Associates of Cape Cod) on spawning beaches differed from those of unbled crabs. In conjunction with this work a study was initiated at the Marine Biological Lab (MBL) in Woods Hole to determine whether tagging itself harmed the crabs. Results were inconclusive, but provided useful information about important parameters to investigate in a future follow-up study.

Blue Crab Investigations

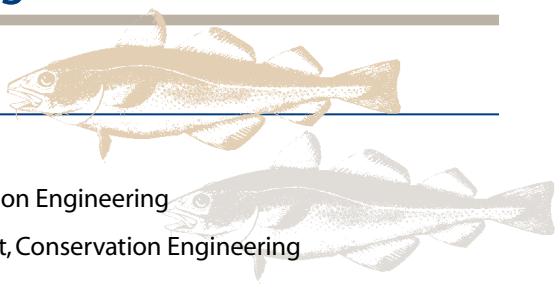
A position paper was prepared which reviewed current blue crab management in Massachusetts. It also addressed a controversial practice on Marthas Vineyard of using blue crabs for conch pot bait and the potential impacts this may have on the resource if the practice becomes more intense and widespread.

Martha's Vineyard salt ponds with barrier beaches require periodic breaching of their beaches to control salinity. Blue crab populations in these salt ponds are particularly vulnerable since the barrier beaches may have the potential to limit their genetic diversity because entry of megalopae from neighboring populations would depend upon the timing of a late summer-fall breach.

A genetic diversity study was planned in cooperation with the University of Maryland to investigate the amount of mixing which may occur among Massachusetts estuarine populations of blue crabs. A quota of 50 crabs was needed from each estuary for a viable DNA analysis in order to assess genetic diversity and geographic variation. A total of 250 blue crabs from five Massachusetts estuarine blue crab populations were collected and shipped to University of Maryland Biotechnology Institute for DNA analysis. The five 50-crab samples were collected from Bass River, Cotuit Bay, Agawam River, Westport River, and Oyster Pond. A preliminary analysis of their mitochondrial DNA indicated that genetic diversity in these Massachusetts blue crab populations was only ½ that of Chesapeake Bay crabs and generally, the populations at the 5 Massachusetts sites appeared to be more genetically discrete than originally thought. However, the investigation of the blue crab genome is still on-going and researchers at the University of Maryland are seeking the least variable area of the genome for analysis of population interrelationships in order to refine analyses of our samples.

A presentation on blue crab biology, management, and recent genetic research in Massachusetts was given to the winter meeting of the Massachusetts Shellfish Officers Association in Plymouth, MA. Discussions are on-going in an attempt to assist several coastal Towns in providing blue crab gauges to blue crab fishermen.

Conservation Engineering and Fisheries Dependent Investigations



Personnel:

Michael Pol, Project Leader

David Chosid, Marine Fisheries Biologist, Conservation Engineering

Mark Szymanski, Assistant Marine fisheries Biologist, Conservation Engineering

Brian Kelly, AQB II, Marine Fisheries Biologist, Fisheries Dependent Investigations

Brant McAfee, AQB II, Marine Fisheries Biologist, Fisheries Dependent Investigations

Overview:

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

Conservation Engineering 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, lobster and fish pots were proposed, initiated, continued, and completed.

Fisheries Dependent Investigations 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 and Conservation Engineering personnel, used the *MarineFisheries*' line testing machine to test rope wear due to lobster vessels' hauling configurations, and 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.

Conservation Engineering Activities

Testing of Cod-Avoiding Trawl Net Designs

A multi-year NOAA Saltonstall-Kennedy grant-funded project was conducted to test two trawls with modified top halves ("Ribas" and "Topless") on Georges Bank. The purpose of the modifications was retention of commercial flatfish and avoidance or escape of Atlantic cod. Results indicated that the Topless net significantly reduced catches of Atlantic cod, legal and sub-legal-sized yellowtail flounder, haddock, monkfish, American plaice, grey sole, winter flounder, and American lobster; the Ribas net showed significant reductions in catches of legal and sub-legal-sized yellowtail flounder, haddock, American plaice, and grey sole. Significant diel differences in the Topless net's catching efficiency for legal and sub-legal yellowtail, grey sole, and winter flounder were found. No diel differences were observed using the Ribas net. Our results imply that light levels affect the behavior and reaction of these species to trawl nets, and that currently permitted use of these nets or a similar design in a 24-hour/day flatfish fishery on Georges Bank should be reinvestigated to determine if Atlantic cod catch rates meet management needs.

A scientific publication describing the results from the Topless net: Diel Variation Within The Species Selective "Topless" Trawl Net, was accepted by the peer-reviewed Journal of Ocean Technology, also posted on the *MarineFisheries* web site, and presented at the Flatfish Biology Conference in Westbrook, Connecticut.

Experimental Haddock Demersal Longline Fishery in Coastal Massachusetts

A manufactured bait, Norbait© 700E, and two natural baits, clams and herring, were tested in Spring 2007 to compare catch of haddock and Atlantic cod using longlines in the Cod Conservation Zone. Trials on a commercial fishing vessel demonstrated that the manufactured bait had the lowest catches of cod and the lowest ratio of cod to legal-sized haddock compared to either clams or herring. Interactions of bait type, area of set, and trip confounded the effects of bait on catch. Based on the haddock catch per unit effort (CPUE), estimates of economic viability using only the manufactured bait suggested that a fishery may be infeasible. However, recent stock assessments indicate that increasing levels of haddock in the area could allow for an experimental fishery to be conducted. The results of this project were published in the November, 2008 issue of Fisheries Research; a link was posted to the *MarineFisheries* website.

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

Initial experimental testing of a grate to exclude dogfish in the whiting trawl fishery along the coast of Massachusetts was conducted in September. This project was funded by the New England Consortium, and if successful, expansion of the whiting trawl fishery may be possible.

Filming and sampling was conducted on board the *R/V Barbara L. Peters* with preliminary observations and fishermen's feedback indicating that the grate was effective in releasing dogfish and retaining whiting. Testing will be continued in 2009.

Determining the Seasonality of Cod Pots

A 2-year project to determine the seasonal vulnerability of Atlantic cod to two types of fish pots (Newfoundland pots, which we have successfully tested in Massachusetts Bay, and Norwegian two-chamber pots that have been successful in Norway) was funded by the New England Consortium. 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 SMAST - UMass Dartmouth, with international input from researchers in Newfoundland and Norway.

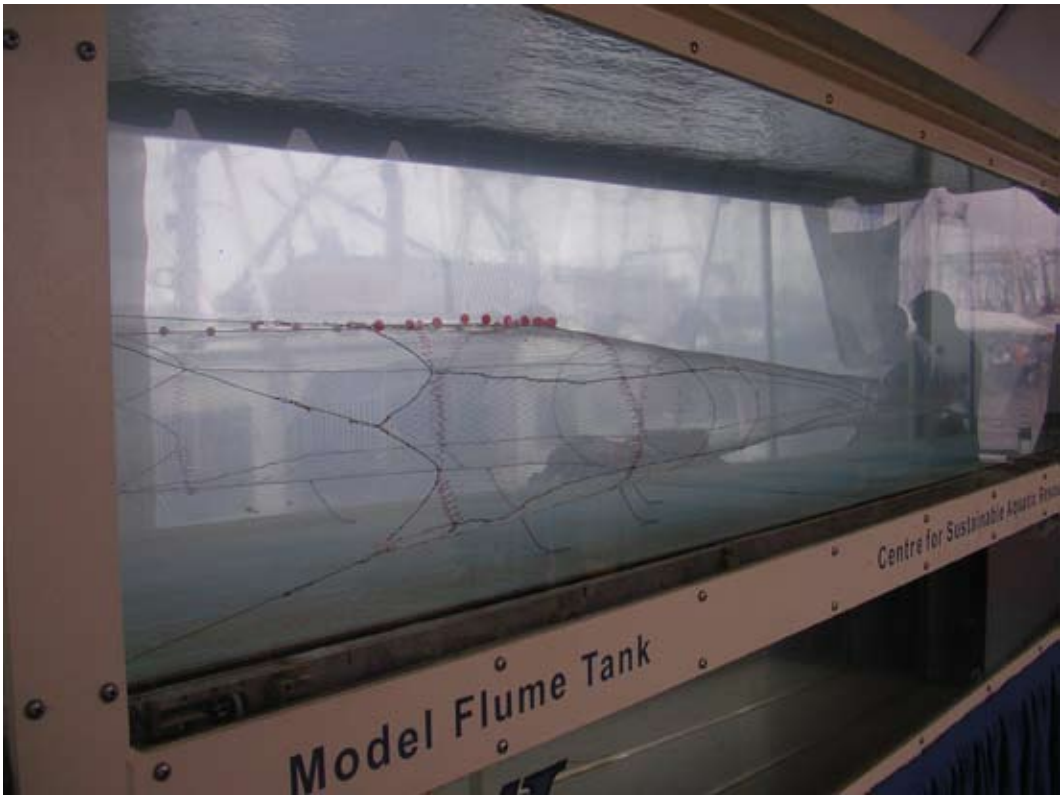
Determining the Best Mesh Size for Gillnetting Monkfish Lophius americanus

This project investigates the size selectivity and bycatch in three mesh sizes of tied-down gillnets. Preliminary results indicated that size selectivity could be successfully modeled for monkfish, and that substantial reductions in discard and increase in revenues are achieved from use of 12-inch mesh gillnets, larger than the commonly-used10-inch minimum size.

Design and Testing of the Five Point Trawl

Multiple projects were conducted which define separate steps in the development and testing of the Five-Point Trawl, an innovative sweepless raised footrope trawl designed by Project staff to target haddock and avoid or release cod. This initiative began in 2004 under the Marine Fisheries Institute (MFI) with flume tank testing of the Five-Point Trawl in Newfoundland and subsequent field testing on one commercial vessel, continued with expanded testing on three vessels funded by *MarineFisheries* and recently involved stability testing on one vessel using video from a Towed Underwater Vehicle (TUV) operated by *MarineFisheries* Habitat Project personnel. The Five-Point Trawl and the TUV were deployed onboard the F/V *Barbara L. Peters* out of Scituate, MA for three days. Video and acoustic data collected during this testing was analyzed and compiled, along with other data from testing, into a movie discussing the Five-Point Haddock Trawl net's stability.

Deployment of the Five-point trawl at sea for stability testing.



Flume tank testing of the Five-point trawl.

Testing of Low-Profile, Low Cod-Bycatch Gillnets: Phases I and II

This Northeast Consortium (NEC)-funded project showed reduction of gillnet height through the addition of spaced weights on a foamcore floatline and replacement of the floatline with another leadline was effective in maintaining flatfish catch amounts and sizes while reducing bycatch of Atlantic cod by 49% and 58%, compared to standard commercial flatfish gillnets in the Gulf of Maine. This project was reviewed and approved by the Research Steering Committee for use in New England Fishery Management Council management actions.

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. A recent independently-created video on Stellwagen Bank National Marine Sanctuary included clips which we provided and a German production company was also provided with our video. An updated video database is under development.

Fisheries Dependent Investigations Activities

Cod Conservation Zone (CCZ) Investigations

This Project supported a number of scientific investigations in the CCZ in 2008 including 8 days at sea to examine gillnet selectivity in February and gear repair/organization, coordination with contract vessel, data organization, and logistics. Additional work involved auditing of the CCZ trawl data; processing of Atlantic cod stomachs collected during the IBS for the GOM cod survey; repairing, standardizing, setting up, deploying, and hauling variable mesh gillnets used to ground truth the BioSonics system acoustic data collected from the CCZ in May; and also sampling of a longline vessel fishing in the CCZ for two days.

Southern New England Fisheries

Several fisheries were sampled at-sea and dockside in Nantucket Sound and Buzzards Bay to provide small sample snapshots of fisheries activities, collect data used in stock assessment and ground-truth each activity and fishery performance. This coverage can vary in response to immediate management needs. Fisheries Dependent Investigations collected more than 15 port samples for a request from management. Eight squid trawl trips and six fluke trawl trips were sampled in Nantucket Sound; two whiting trawl trips were completed out of Provincetown. Data from these trips were entered and delivered to NMFS/NOAA and senior *MarineFisheries*' staff for interpretation of fishery conditions.

Striped Bass Acoustic Tagging Project

An acoustic array was deployed in Cape Cod and Massachusetts Bays in 2008 to examine the inshore/offshore movements of striped bass. Project personnel assisted in the research, creation, maintenance and retrieval of the acoustic array and in the tagging of striped bass.

Pelagic Fishery Sampling Deployments

A program was initiated in 2008 to quantify the bycatch of non-target species, with particular interest in river herring, American shad, and haddock in pelagic fisheries. Considerable time was dedicated to the preparation and organization of the sampling methods for this project. Accordingly, 10 port sampling trips were completed in Gloucester Harbor.

Protected Species Project

Personnel:

Erin Burke, Protected Species Specialist

Overview:

Protected Species personnel were involved in a variety of activities related to the conservation and protection of marine endangered mammals and turtles including northern right whales and other large whale species and harbor porpoise. This includes all efforts of the Right Whale Conservation Program, oversight of the federally-funded Cape Cod Bay Right Whale Surveillance Program, and Right Whale Acoustic Monitoring Program. These activities covered a range of issues to promote the co-existence of maritime industries and protected species.

Protected Species Activities

Cape Cod Bay Right Whale Surveillance Program

The Cape Cod Bay Right Whale Surveillance Program (conducted through a partnership with the Provincetown Center for Coastal Studies and funded by the National Marine Fisheries Service) consists of aerial surveillance and habitat monitoring of right whales in Cape Cod Bay. The surveys in 2008 were notable for producing the highest number of unique right whales ever observed in the 10-year history of the project, over186.

Right whale skim-feeding in Cape Cod Bay.

Right Whale Acoustic Monitoring

MarineFisheries has partnered with Cornell University and Woods Hole Oceanographic Institution since 2003 to develop and implement a real-time acoustic monitoring system for right whales. The Project Leader oversees the grants, contracts, and invoices associated with maintaining 3 real-time buoys in Cape Cod Bay and coordinates with our partners buoy deployment and retrieval, buoy design updates, and the right whale call detection website. Participated in the buoy deployment cruise in December 2007 was undertaken in preparation for the 2008 "listening season", as well as coordinating and assisting in a buoy repair trip in March 2008 with

Acoustic monitoring buoy.

the help of the Massachusetts Environmental Police (MEP). During the 2008 "listening season", 3,517 confirmed right whale calls were recorded in Cape Cod Bay. The first call was detected on Christmas Eve 2007 and the last call was detected on May 10, 2008.

In 2008 the addition of an elastic hydrophone tether (the Gumby hose) helped reduce false detections, however, problems still existed with the external computer hardware attachment to the surface system. To remedy this, WHOI designed a new surface buoy where the electronics are stored in canisters inside the buoy itself. In December, three of these new buoys were deployed in Cape Cod Bay in anticipation of the 2009 right whale season. They began detecting right whales almost immediately and the new design has eliminated the transmission problems associated with the old system.

Previous funding for this acoustic work came from National Fish and Wildlife Foundation (NFWF) and National Marine Fisheries Service (NMFS) grants. However, starting in January 2008, *MarineFisheries* began supporting this program with compensatory mitigation funds received from the offshore LNG projects in Massachusetts Bay.

Ghost Gear Removal

During the 2008 season, *MarineFisheries* partnered again with the Massachusetts Environmental Police (MEP), local lobstermen, and the International Fund for Animal Welfare (IFAW) to remove ghost gear from Cape Cod Bay. IFAW provided $10,000 for vessel time to hire local lobstermen to assist in locating and removing gear. Locations of gear were reported by the Center for Coastal Studies (CCS) aerial and habitat surveillance teams. These gear locations were received from CCS, plotted, and maps forwarded to the MEP.

Close to 500 non-compliant traps were pulled from Cape Cod Bay Critical Habitat in 2008. In one fisherman's case, more than 180 traps were seized for violating whale regulations and that fisherman's license has since been revoked.

Sea Turtle Disentanglement

MarineFisheries and the Provincetown Center for Coastal Studies jointly operate the Massachusetts Sea Turtle Disentanglement Network with funding from a NMFS Endangered Species Act Section 6 grant. In 2008 there were 11 confirmed unique cases of leatherback sea turtle entanglement in buoy lines in Massachusetts waters. Of those cases, 7 were successfully disentangled, 2 entangled live turtles were unable to be relocated, and two entangled animals were found dead in the gear. All entanglement cases involved pot gear. Cooperation was also given to UNH's Large Pelagic Lab to place satellite tags on turtles to determine seasonal movements of leatherbacks.

Disentanglement of a Loggerhead turtle.

Lobster claw banded with whale-safe promotional band.

Massachusetts Lobster Promotional Program

In July 2008, a new lobster promotion campaign was launched to educate consumers about what Massachusetts lobstermen are doing to protect endangered whales. *MarineFisheries* partnered with the Massachusetts Lobstermen's Association, 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.

Harbor Porpoise Management

To enhance the protection of harbor porpoise, staff worked with federal partners and MEP to educate gillnetters on the use of acoustic deterrents, known as pingers.

"Whale-Safer" Gear Research

In 2008, *MarineFisheries* and the Atlantic Offshore Lobstermen's Association (AOLA) received funding from NMFS to examine how minor changes to the lobster gear hauling equipment could reduce damage to sinking groundline and improve the service life. Investigations into the effect of sheave angle and spacing, knife shape, and knife and sheave material were conducted. A presentation was made on these hauler investigations at the Maine Fishermen's Forum, the Large Whale TRT meeting, and at a UNH-sponsored gear workshop.

A gear identification study was coordinated using microchips embedded in ropes. The project was a collaboration between *MarineFisheries* and the Center for Coastal Studies to test the feasibility of these 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.

Management Information Systems & Fisheries Statistics

Personnel:

Thomas Hoopes, Project Leader

Micah Dean, Data & GIS Analyst

Story Reed, Fisheries Data Collection

Kim Lundy, Dealer Reporting Coordinator

Julian Race, GIS Analyst & Network Administration

M. Fletcher, Fisheries Data Entry

R. Mitchell, Fisheries Data Entry & Licenses

L. Lowrey, Contractor – Fisheries Data Entry

L Sahaya, Contractor - Oracle Database Developer

1. Catch and Effort & Landings Data Collection

Overview:

The project collects catch and effort data from commercial fishermen as well as landings data from dealers who are designated as 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).

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 are processed and entered by project personnel at the Annisquam River Marine Fisheries Station in Gloucester. Depending on the report type, data is entered either to the Executive Office of Energy & Environmental Affairs (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.

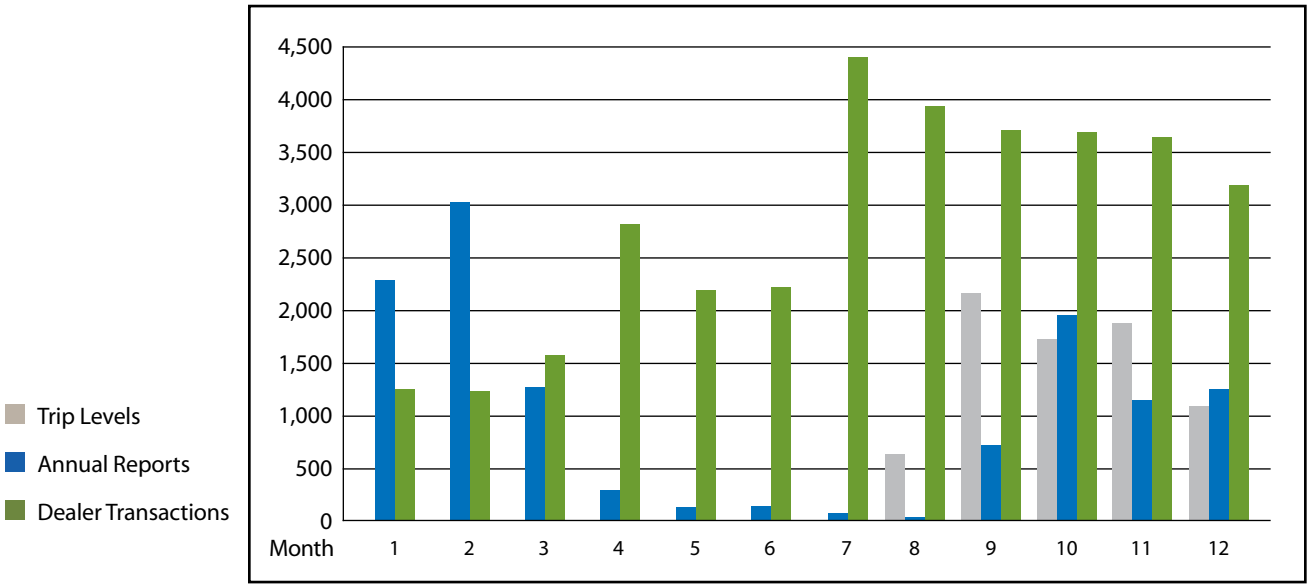
Table 1. Number of Permits Issued and Corresponding Reports Entered during 2008.

Catch Report - Annual Reports	# Issued
Coastal Lobster (2007)	1,361
Fish Pot - Conch (2007)	155
Fish Pot - Scup (2007)	162
Fish Pot - Sea Bass (2007)	63
Fluke (2007)	984
Gillnet (2007)	121
Groundfish (2007)	990
Offshore Lobster (2007)	265
Offshore Lobster-non Trap (2007)	265
Sea Urchin Diver (2007)	114
Sea Urchin Dredge (2007)	155
Seasonal Lobster (2007)	106
Shellfish (2007)	3,247
Striped Bass (2008)	3,647

Catch Report - Monthly Reports	# Issued
American Eel (2008)	115
Contaminated Surf Clam (2008)	17
Fish Weir (2008)	11
Horseshoe Crab Bait Permits (2008)	280
Horseshoe Crab Biomedical Permits (2008)	21
Ocean Quahog (2008)	29
Quahog Dredge (2008)	53
Surf Clam (2008)	37
Trip Level (All Species) (2008)	127

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 Entered by Month – 2008



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 *MarineFisheries* 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, 2008, 1,451 businesses obtained a 2008 MA dealer permit of one kind or another. Of those, 396, or twenty-seven percent, were categorized as primary buyers, which meant they intended on purchasing one or more marine species directly from fishermen during 2008. As a result, these dealers were required to report their primary purchases, including products retailed themselves. Of the 396 dealers, 146 had a federal dealer's permit which required reporting electronically to the SAFIS database. These dealers were categorized as "federal-reporting" dealers. The remaining 250 dealers were categorized as "state-reporting" dealers.

Even though many of the primary buyers in 2008 have been primary buyers in years past, 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 2008, 158,855 transactions (not including negative reports) were entered into the SAFIS database, covering over 395,890 individual species landings, or 2.5 species per transaction. Of those, 35,266 transactions (or 22%) 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 *MarineFisheries* staff over the course of 2008.

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 530 million lbs, valued at $383 million. The top five species in order of value were sea scallop, American lobster, Atlantic cod, haddock and goosefish, totaling $287 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 29 million lbs at $23.5 million. Landed species with a total gross value over $1 million are shown in Table 2.

Table 2. 2008 Pounds of MA Landed Species with Value Greater than $1 Million*

Species	Lbs (Whole) **	Value
Scallop, Sea	225,582,413	$190,338,410
Lobster, American	10,303,799	$44,182,362
Cod, Atlantic	16,082,297	$24,190,109
Haddock	12,475,025	$14,415,005
Goosefish	12,607,985	$14,206,728
Herring, Atlantic, Sea	96,567,707	$10,542,919
Pollock, Atlantic	15,456,305	$7,858,541
Flounder, Winter	3,982,823	$7,340,639
Clam, Soft	5,380,637	$6,992,762
Clam, Northern Quahog	6,388,610	$5,241,431
Flounder, Yellowtail	3,204,768	$4,592,569
Oyster, Eastern	2,146,598	$4,395,199
Flounder, Witch (Gray Sole)	1,777,164	$4,195,289
Skates	19,373,016	$4,168,172
Mackerel, Atlantic	35,891,585	$3,914,841
Striped Bass	1,163,120	$3,560,360
Whelk, Channeled	2,812,216	$3,213,715
Flounder, Plaice, American (Dab)	1,944,589	$2,926,669
Crab, Jonah	4,438,927	$2,630,528
Hake, Atlantic, White	2,006,037	$2,585,150
Flounder, Summer (Fluke)	644,477	$1,779,085
Menhaden	14,086,963	$1,554,022
Hake, Silver (Whiting)	3,013,586	$1,524,049
Squid, Long Finned (Loligo)	1,501,086	$1,444,546
Scallop, Bay	947,992	$1,442,785
Perch, Ocean(Redfish)	2,363,133	$1,260,108
Swordfish	456,261	$1,169,957
Hagfish	1,841,067	$1,101,613
Clam, Surf	5,356,312	$1,073,424

* As of 22-Jan-2009. Does not include offshore ocean quahog / surf clam and Bluefin tuna fisheries

** All reported units were converted to whole pounds

The year 2008 marked the second year where all data entered into the SAFIS database for Massachusetts, with the exception of certain offshore shellfish fisheries and large pelagics, was used by NOAA Fisheries in their compilation of the Fisheries of the United States (FUS). *MarineFisheries* considers this a major accomplishment towards accurately documenting the universe of landings and ex-vessel value in Massachusetts.

Data Analysis and Dissemination

Requests for data and analysis both from within and outside *MarineFisheries* were routinely processed over the course of the year. The most frequently requested topics were lobster, striped bass, Nantucket sound, shellfish, and groundfish were the most frequently requested topics. Quotas for select fisheries were monitored closely and dealers notified when quotas were filled.

The outcomes of recent stock assessments for scup, black sea bass, summer flounder and tautog have led to substantial reductions in Massachusetts commercial quotas. This made monitoring the consumption of these quotas and forecasting the closure dates of these fisheries particularly difficult, as reduced quotas mean very short seasons and an increased possibility of overfishing the quota.

In April, the United States Congress appropriated over $12 million in relief funds to Massachusetts fishermen to alleviate economic impacts associated with recent effort restrictions placed on the mutispecies groundfish fishery. Considerable time was spent providing analytical support for this program which disbursed funds to fishermen based on their individual reported fishing histories.

In May, MA Governor Patrick signed the Oceans Act of 2008, which requires the Commonwealth to develop a comprehensive Ocean Management Plan by July of 2009. Several working groups were established that spanned all of the environmental agencies and were given the task of assembling all information that pertained to the coastal waters of Massachusetts. Project staff took the data/GIS lead for the Fisheries Workgroup and as such conducted many rounds of analyses in an effort to condense thirty years of fisheries data down to a few useful maps.

2. Management Information Systems (MIS) / Information Technology (IT)

This project provides many services to the agency under the umbrella of Information Systems/ Technology 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. The project leader serves as the *MarineFisheries* representative on the Department of Fish & Game's Information Technology Core Team, which oversees Department IT initiatives. This team met on several occasions during the year to discuss a number of IT issues and set Department policy where needed. *MarineFisheries* uses the EEA Data Center for its Oracle database applications and other services such as network access, email, Internet website and anti-virus software are all provided by the Commonwealth's Information Technology Division (ITD). As such, certain standards must be 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 have occupied a big portion of the project's time as the agency becomes more proficient with the technology and *MarineFisheries* specific data layers are developed.

- **Network & PC / Server Administration:** The project leader continued as the lead network administrator for the MarineFisheries, configuring specific hardware and software to conform to the network and needs of the users.

Website Development & Maintenance: The *MarineFisheries* 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. In 2008, an internal Intranet site using Wiki technology was created to provide both agency-wide as well as project-specific functionality to agency personnel. Agency users can now add to and update their own project pages, relieving project personnel from having to post these changes.

Oracle Database / Application Development & Maintenance: There are currently four production databases that *MarineFisheries* uses: Commercial Permits and Statistics (FISH2000); Lobster Sampling (LOBSAMP); Shellfish Sampling & Area Management (SHLFSH); Time Tracking for Federal Grants (TimeSheet). The Oracle contractor working for *MarineFisheries* made several enhancements to the FISH2000 application over the course of the year.

GIS Technical Assistance & Data Development: Project personnel have been working closely with shellfish biologists to re-digitize designated shellfish growing areas (DSGA) statewide. Using input from the biologists, a new GIS datalayer has been developed at a scale of 1:5,000 that significantly improves upon the previous datalayer developed more than ten years ago at 1:25,000. The new layer incorporates accurate boundaries for the growing areas and the inherent classification areas within, and can be superimposed on fine resolution imagery data to produce high-quality, up-to-date maps useful for planning, regulatory reference and dissemination to the public.

New tools have been investigated to allow for more efficient management and distribution of shellfish GIS data. A web-based management tool was created to allow quick and easy control of shellfish classification area status changes. Finally, *MarineFisheries* is seeking to work closely with MassGIS to develop a web-based mapping interface that can be used to deliver real-time, web-based maps to regional shellfish biologists as well as members of the public.

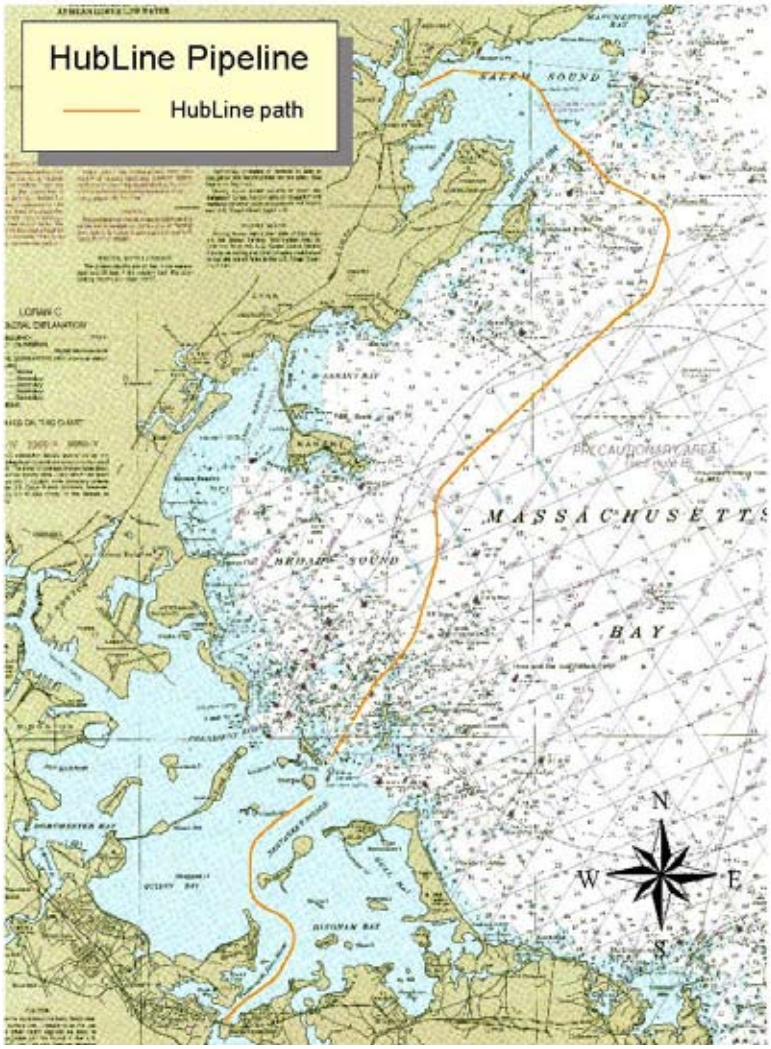
HubLine Impact Assessment, Mitigation, and Restoration Program

Personnel:

Bruce T. Estrella, Program Manager

Overview:

Monitoring and mitigation/restoration activities were conducted by the Division of Marine Fisheries (*MarineFisheries*) from 2003 through 2008 in response to assumed impacts from the construction of the HubLine natural gas pipeline in Massachusetts Bay. This program represents the first, large-scale, comprehensive effort by *MarineFisheries* to assess and mitigate for impacts from a major marine construction project in Massachusetts coastal waters. After 5 years of work, the HubLine Impact Assessment and Mitigation/Restoration Program was drawn toward completion. The final phases of field work and associated data analyses were conducted during 2008 and administering HubLine funds, associated accounting tasks, and drafting of the HubLine completion report represented core tasks during this calendar year. The *MarineFisheries* HubLine web site was updated as program report segments were completed. Several "spin-off" manuscripts from the report were prepared for submission to scientific journals and work was initiated on a less technical version of the HubLine completion report for general distribution.



HubLine Assessment Activities

MarineFisheries' post-construction assessment activities of the HubLine pathway were multi-faceted and intended to evaluate impacts from the construction and monitor recovery. This long term effort included specific assessment and monitoring plans which, in some cases, were associated with related and co-occurring mitigation project field activities. Acoustic and optical surveys of sediment and biota, species diversity investigations and on-going *MarineFisheries* surveys helped to contribute to the evaluation of potential impacts. Commercial lobster sea sampling, ventless lobster trap monitoring, early benthic phase lobster suction sampling, and standardized bottom trawl survey data were incorporated into the final assessment of relative abundance trends for species inhabiting the impacted area.

Acoustic and Optical Surveys of Pipeline Pathway

Monitoring studies were initiated by *MarineFisheries* in August 2003 with several localized sampling efforts which indicated that significant changes in vegetation and re-colonization of crustaceans and finfish had occurred in a relatively short time since the pipe was laid. There was no definitive evidence found that surface-laid pipe or its trench construction blocked the seasonal inshore migration of lobsters.

Broader-based, multi-year monitoring of the pipeline pathway began in March 2004 after the construction schedule of trench back-filling and leveling was projected to be completed. Sonar and video monitoring indicated impacted sediments along the 29.4-mile path had not yet been restored to pre-construction quality. A considerable amount of relief was evident in elongated spoil piles 1-2m in elevation. Width of disturbed sediments along the pathway generally significantly exceeded estimates provided during the pre-construction review process and approached 25 m (75ft). Overall, most of the back-filled trench, especially areas with cobble deposition or a cobble sand mix suggested early stages of flora and fauna colonization.

Four years after pipeline construction, relief created by trenching and back-filling persisted at most sites and ROV video surveys indicated that full recovery of algal growth, macro-invertebrate, and finfish species had not yet occurred. More algal, hydroid, and sponge growth was present on nearby natural bottom compared to sites on the back-filled pipeline trench.

Algal growth and invertebrate and finfish presence/abundance was related to bottom type and depth. Sites at >50 ft depth exhibited invertebrate and finfish presence, but minimal attached growth. Hard substrate facilitated attachment of algae, but the proliferation of algal growth was largely dependent upon shallow water depths to allow light penetration for photosynthesis.

Species Diversity

Benthic infaunal communities were investigated for evidence of impact from the construction process which occurred between 2002 and 2003. Pipeline trenching and trench back-filling may have originally impacted these benthic infaunal communities, but 2008 analyses indicated that the benthic communities along the HubLine route appeared to be largely recovered. Their species diversity and evenness values were similar to those at ambient control stations located outside the HubLine area of disturbance and within the mean baseline range of MWRA's Harbor Outfall Monitoring program.

Species diversity of epibenthic fauna on hard-bottom sites was also investigated. In most cases, species diversity on the natural reef was significantly different and still higher, with some seasonal variation, than that on the HubLine back-filled trench approximately 4 years after pipeline construction.

Commercial Lobster, Suction Sampling, and Bottom Trawl Surveys

Commercial Lobster, Suction Sampling, and Bottom Trawl Surveys are several on-going *MarineFisheries*' surveys which were incorporated into the 2008 HubLine impact assessment. Standardized catch rate (CPUE) trends from *commercial lobster sea sampling* depict a general downward trend from 1999-2007, however, this is consistent with a broader-based downward

trend elsewhere in the Gulf of Maine. The time series of *suction sampling* data for early benthic phase (EBP) lobsters in the Massachusetts Bay area showed no obvious correlation with the 2002-2003 HubLine construction period. *Bottom trawl survey* data were used to evaluate relative abundance trends for selected species from the HubLine study area. Relative biomass (mean weight per tow) and relative abundance (mean catch per tow in number of animals) from 1978-2007 was analyzed for Atlantic cod, winter flounder, yellowtail flounder, American lobster, and Sea Scallops but trend analyses did not depict any obvious relationship with the HubLine construction period.

HubLine Mitigation Projects

Four mitigation projects were undertaken by *MarineFisheries* staff with the intention of aiding various life stages of a broad array of marine species. They addressed eelgrass restoration, habitat enhancement, anadromous fish restoration (including anadromous fish run restoration, smelt restoration, and shad restoration), and shellfish restoration and stock enhancement:

Eelgrass Restoration Project

Personnel: Bruce T. Estrella, Project Supervisor:
Alison S. Leschen, Marine Fisheries Biologist
Ross K. Kessler, Assistant Marine Fisheries Biologist
Fisheries Technicians: Kate Lin Taylor, Cate O'Keefe, Theresa Vavrina, Wesley Dukes

The primary goal of the *MarineFisheries* Eelgrass Restoration Project was to re-establish eelgrass in Boston Harbor as partial mitigation for assumed impacts to the environment from the pipeline construction. Restoration of eelgrass habitat provides shelter, food, and has the potential to positively affect abundance of a number of finfish and invertebrate species judged to be potentially impacted.

Following extensive site selection work, planting was conducted using a combination of hand- and frame-planting, and seed dispersal. The site selection process achieved successful results at 4 of our 5 sites. Shoot density expanded significantly and areal coverage estimates in 2008 were over 2 hectares (~ 5.5 acres). Biological monitoring indicated that ecosystem function of transplanted beds compared favorably to existing Boston Harbor eelgrass beds, and approached healthy beds in Nahant for several indices.

Outreach was an important part of the Eelgrass Restoration Project. We provided a "hands-on" educational experience for members of the community and promoted stewardship of this valuable resource. A total of 155 volunteers donated 428 hours during our restoration activities.

Eelrass bed planted by MarineFisheries off Long Island in Boston Harbor, MA.

Habitat Enhancement Project

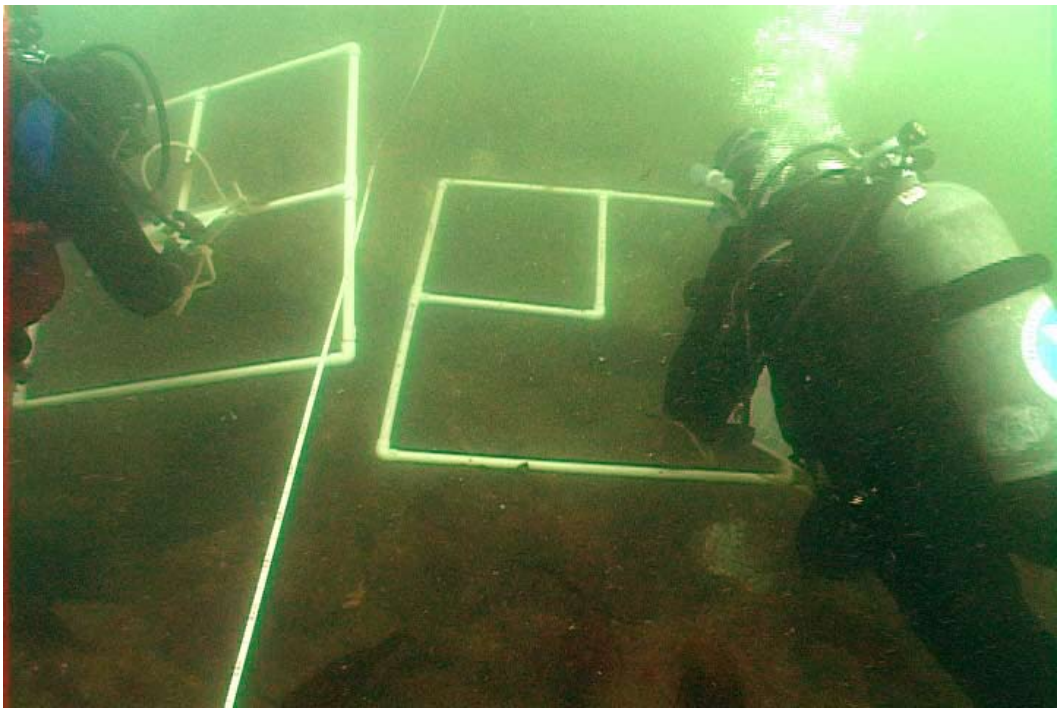
Personnel: Robert P. Glenn, Project Supervisor
Julie S. Barber, Marine Fisheries Biologist
David M. Chosid, Assistant Marine Fisheries Biologist
Kelly A. Whitmore, Assistant Marine Fisheries Biologist

MarineFisheries constructed a six unit cobble-boulder reef off Boston Harbor in order to provide partial mitigation for the assumed impacts to biological resources and habitat from HubLine construction. This Project enhances complex substrate in Massachusetts Bay, thereby providing niches for multiple life stages of numerous finfish and invertebrate species.

An intensive, long-term monitoring program was implemented to measure ecological variation on the artificial reef and to determine how well the artificial reef met specific goals. Results indicated that the artificial reef had the highest diversity of enumerated species, yet the lowest diversity of species assessed by percent cover. This difference was likely due to species life histories, as the artificial reef quickly attracted mobile invertebrates and fish species that preferred complex habitat with high relief, whereas sessile, slower-growing species take longer to settle and establish.

The cobble and boulder artificial reef did provide habitat for the hard-bottom encrusting community, larval settlement occurred in similar densities to adjacent comparison sites, and the abundance of cunner is currently higher on the artificial reef than the natural reef.

Monitoring efforts are on-going.



Diver collecting data on the artificial reef using quadrats.

Anadromous Fish Restoration Project (3 parts)

The Anadromous Fish Restoration Project enhanced the anadromous fish resources in the embayments and associated watersheds adjacent to the HubLine Pipeline. These are resources that were potentially impacted by the HubLine construction. The project consisted of propagation/stocking, monitoring, construction and repair of anadromous fish passage, and improvements to habitat. There were three parts to this restoration effort:

1. Anadromous Fish Passage Enhancement

Personnel: Kristen H. Ferry, Project Supervisor
Ed Clark and Louis Carmo, Laborers
Phil Brady, Senior Marine Fisheries Biologist

The Anadromous Fish Passage Enhancement Project had the objective of enhancing and increasing the spawning habitat for alosid fishes (alewives, *Alosa pseudoharengus*; blueback herring, *Alosa aestivalis*; American shad, *Alosa sapidissima*). *MarineFisheries* selected and completed 20 projects in 13 systems in the HubLine region that (a) ranged from minor to major fishway improvements, (b) created new passage for anadromous fish, (c) evaluated the feasibility for restoring anadromous fish populations, (d) restored or enhanced spawning habitat, and (e) developed innovative technology for assessing river herring passage and run size (Tables 1 and 2).

To improve population assessment of river herring, Marine Fisheries funded 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 Commonwealth streams, and which can produce scientifically reliable population estimate data. Population size estimates generated in the first full field season of this experimental approach yielded:: Back River, Weymouth 69,052; Charles River, Watertown, 43,230; and Town Brook, Plymouth, 125,840 (Table 2). Work on this counting technique will continue to be improved and refined.

Table 1. HubLine anadromous fish passage enhancement and feasibility projects.

System	Town	Obstruction	Work Description
Crane River	Danvers	N/A; instream habitat	Restoration of riffle spawning habitat for smelt; riparian habitat enhancement
Forest River	Salem	Culvert at Coy Pond & instream habitat	Evaluation and enhancement of American eel passage and smelt spawning habitat
Saugus River	Saugus	Lynn Waterways Dam	Installation of eel ramp & monitoring of American eel population
Charles River	Watertown	Bleachery Dam	Dam breach to create fish passage on river's north side
Charles River	Waltham	Moody St. Dam	Fishway repairs and improvement
Charles River	Wellesley; Newton	Finlay Dam	Replacement of fishway baffles
Charles River	Wellesley; Newton	Cordingly Dam	Replacement of fishway baffles
Neponset River	Milton; Mattapan	Walter Baker Dam; Tilestone and Hollingsworth Dam	Supplemental feasibility study for dam removals and contaminant remediation; collaborative project with Riverways, Dept.of Fish and Game
Fore River; Monatiquot River	Braintree	System-wide (five total)	Feasibility study to evaluate river herring passage and restoration
Fore River; Monatiquot River	Braintree	N/A	Installation of USGS staff gage and development of rating curve
Back River	Weymouth	Jackson Square Dam	Removal of accumulated sediment and artificial weir below fishway
Back River	Weymouth	Jackson Square Dam	Streambed enhancement below fishway to accommodate smelt spawning & river herring passage; increased shading
Back River	Weymouth	Iron Hill Dam	Installation of protective grating on fishway & construction of viewing platform (Eagle Scout project)
Weir River	Hingham	Foundry Pond Dam	Restoration of smelt spawning habitat in spillway
Weir River	Hingham	Foundry Pond Dam	Fishway repairs and partial reconstruction
Weir River	Hingham	Foundry Pond Dam	Evaluation of system-wide herring spawning habitat and outmigration options; herring population monitoring; development of water management plan
Bound Brook	Cohasset	Hunters Pond Dam	Feasibility study to evaluate anadromous fish passage improvements and restoration
Indianhead River	Hanover	Elm St. Dam	Fishway reconstruction and baffle replacement
Herring Brook	Pembroke	3rd Mill Ponds Dam	Installation of steeppass fishway and related engineering

Table 2. Digital video assessment of herring runs at Town Brook, Back, Charles, and Bourne Rivers. The number of time intervals possible, number of intervals counted, average fish per interval, and point estimates of run size are provided.

System	Number of 10 minute intervals possible	Number of 10 minute intervals in which fish were counted	Average number of fish per 10 minute interval	Estimate of run size (number of fish passing upriver)
Town Brook	5040	321	24.97	125,840
Charles River	2016	126	21.44	43,230
Back River	5040	284	13.71	69,052
Bourne River	5040	315	10.34	53,151

2. The Rainbow Smelt Culture and Enhancement Project

Personnel: Bradford Chase, Project Supervisor
Matt Ayer, Assistant Marine Fisheries Biologist
Scott Elzey, Fisheries Supervisor
Carolyn Woodhead and Sara Turner, Fisheries Technicians

The Rainbow Smelt Culture and Enhancement Project assisted the restoration of rainbow smelt (*Osmerus mordax*) populations in several river systems in the Massachusetts Bay area. *MarineFisheries* has sought to improve population assessment capabilities and management measures for the enhancement and restoration of smelt populations.

Approximately 5.3 million oxytetracyclene (OTC)-marked smelt larvae were stocked into the Crane River during 2005-2008. The analysis of age-1 smelt otoliths from 2008 fyke net catches at restoration river stations found 16% of the Crane River age-1 smelt and 14% of the North River age-1 smelt were stocked as larvae by this project. Conclusions cannot be reached on the contributions of larvae stocked in 2005 and 2006 because these smelt were marked as eggs and subsequent investigations found that those marks did not persist in hatchery specimens reared for one year. The smelt larvae stocked in 2007 and 2008 were marked as larvae with 500 mg/l OTC which our laboratory investigations indicate is more durable than the egg marking and does not negatively influence egg or larval survival.

Age 1 and 2 smelt.

Smelt fyke nets successfully captured smelt at all six stations during 2005-2008 revealing unique population signals of spawning run seasonality, age composition, and size at age. This technique shows promise for tracking age composition and cohort strength.

We believe these efforts mark the first time rainbow smelt have been reared on a dry diet and to maturity in a closed-loop hatchery system. The recapture of OTC-marked rainbow smelt in the Crane River is also a novel achievement that may develop into a restoration tool that can be applied in other river systems.

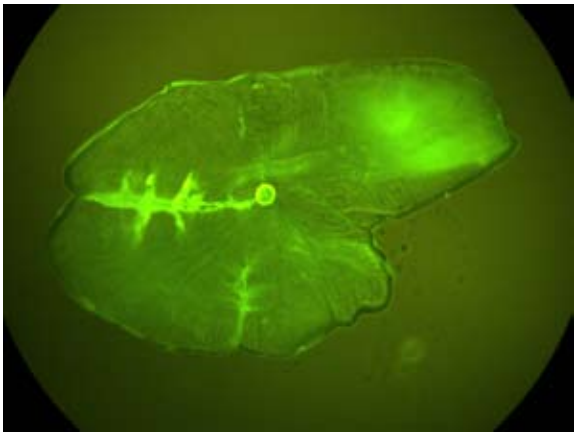
3. American Shad Propagation

Personnel: Kristen Ferry, Project Supervisor
Holly Frank, Ashley Silberzweig, and Sara Turner, Fisheries Technicians

The American Shad Propagation Project is a collaborative effort between *MarineFisheries* and the U.S. Fish and Wildlife Service to restore viable populations of shad to the Charles and Neponset Rivers by establishing a fry-stocking program and improving fish passage in these systems. Significant fish passage improvements were made to the Charles River, but passage in the Neponset River was not projected to be realized during this study period, so all American shad fry production was allocated to the Charles River.

Despite coincident high water flow events in the Merrimack River that limited broodstock availability, the HubLine American Shad Propagation Project successfully produced and stocked shad fry in the Charles River between 2005 and 2008. In June 2005, following infrastructure installation, limited pilot production was conducted at Essex Dam and at the North Attleboro National Fish Hatchery and by spring 2006, full-scale spawning and rearing was operational at the

Nashua and North Attleboro National Fish Hatcheries and at Essex Dam. From 2006 through 2008, approximately 3000 adult American shad broodstock were captured at the Essex Dam, Merrimack River, injected with hormone and successfully spawned. A total 3.6 million shad fry were immersed in an oxy-tetracycline bath to mark their otoliths and stocked in the Charles River.



Oxytetracycline mark (bright ring in center of image) on juvenile American shad otolith from the Charles River, Waltham, MA.

Otolith marking allows identification and quantification of hatchery-origin shad in 3-4 years when these fish reach maturity and return to spawn. A successful restoration will be indicated in future years by the presence of a greater number of naturally-spawned individuals as compared to hatchery-spawned individuals.

Shellfish Stock Enhancement Project

Personnel: Thomas Shields, Project Supervisor
Brian Doran and Sara Turner, Fisheries Technicians

The Shellfish Stock Enhancement Project is restoring/enhancing soft-shell clam (*Mya arenaria*) populations in five Boston Harbor communities Winthrop, Quincy, Weymouth, Hingham and Hull. Restoration is being conducted through cooperative programs with local municipalities, commercial shellfishers, and Salem State Northeast Massachusetts Aquaculture Center (NEMAC), with funding and technical assistance from *MarineFisheries*.

Prelimary work was conducted in 2006, when a study 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. 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 were stocked at twelve enhancement sites in Hull, Winthrop, Quincy, Weymouth and Hingham. A controlled harvest of two of the 2006 enhancement plots was undertaken in 2008. Legal-sized clams were depurated at the Newburyport plant and later sold by the Master digger. Under-sized clams were replanted within the harvested plots.

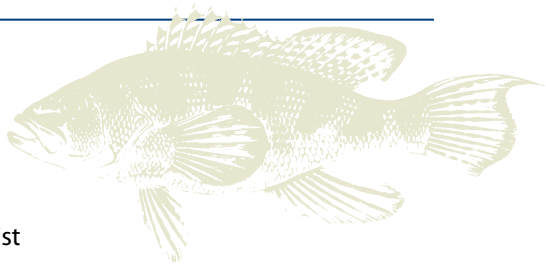
Softshell clam seeding and installation of predator netting on plot off Weymouth , MA

Sportfish Program:
Recreational Fisheries Project, Diadromous Fisheries Management and Restoration Project, and Resource Assessment Project

Michael P. Armstrong, Program Manager

Recreational Fisheries Project

Personnel:



Paul Caruso, Senior Marine Fisheries Biologist

Gary Nelson, Senior Marine Fisheries Biologist

Gregory Skomal, Senior Marine Fisheries Biologist

John Chisholm, Marine Fisheries Biologist

Jenni Stritzel-Thomson, Assistant Marine Fisheries Biologist

John Boardman, Assistant Marine Fisheries Biologist, South Shore/South Coast/Cape Cod Areas

Kelley Dumas, Seasonal Fisheries Technician, South Shore/South Coast/ Cape Cod Areas

Matt Ayer, Assistant Marine Fisheries Biologist, North Shore Area

Scott Elzey, Seasonal Fisheries Technician, North Shore Area

Joshua Dayton, ASMFC contract technician

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.

MRIP Contracted Sampling Program

Since 1983, recreational fisheries catch and harvest data has been collected along the United States Atlantic Coast through the Marine Recreational Information Program (MRIP). This survey collects catch and effort data through a two part survey. A random telephone survey of coastal households and field interviewers to intercept fishermen at coastal locations, docks, jetties, and on board vessels. Formerly administered by NMFS contractors, the responsibility for running this program is in transition and *MarineFisheries* is currently managing the "party boat" survey segment for Massachusetts waters. Seventy two sea sampling trips were completed for a total of 131 sampler days and 1176 angler intercepts. Data were digitized and made available for stock assessment analyses as needed.

Massachusetts Sportfishing Tournament Monitoring Program

Extensive recreational fisheries for sharks, tunas, and marlins off the coast of Massachusetts and also inshore game fish 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 CPUE 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 (boated, released, tagged, lost), and weather conditions.

In 2008, data were collected at all major big game fishing tournaments held in Massachusetts. Catch and effort data were obtained from three multi-species tournaments, two shark tournaments, and one bluefin tuna tournament (Table 1).

Table 1. 2008 Massachusetts offshore fishing tournaments

Tournament	Location	Species	Dates	No. Boats	Effort (boat hrs.)
Oak Bluffs Monster Shark (22nd annual)	Oak Bluffs	Shark	7/18-19	202	3383.0
Falmouth Grand Prix (18th annual)	Falmouth	Billfish/tuna/ shark	8/15-16	10	169.6
Top Gun Marlin and Tuna Shootout (14th annual)	Oak Bluffs	Billfish/tuna/ shark	8/15-16	6	118.2
Nantucket Shark (5th annual)	Nantucket	Shark	8/23-24	24	456.0
Hyannis Anglers Club Bluewater Billfish (5th annual)	Hyannis	Billfish/tuna/ shark	8/23-24	8	242.4
South Shore Tuna Tournament (1st annual)	Scituate	Bluefin tuna	9/20-21	63	1228.5
Total				313	5597.7

Technical Committee and Stock assessment Support

Participation on various technical committees is on-going including the ICCAT Advisory Committee (International Commission for the Conservation of Atlantic Tunas), Atlantic Coastal Sharks Technical Committee (vice-chair), ASMFC (Atlantic States Marine Fisheries Commission), and Mid-Atlantic Fisheries Management Council. Management initiatives were undertaken for key recreational species: summer flounder, scup, bluefish, black sea bass, striped bass, and river herring. Research, statistical, and international management recommendations were developed for bigeye, yellowfin, albacore, and skipjack tunas.

Tautog assessment model runs indicated that both Massachusetts' and Rhode Island's fishing mortality rates remain well below the ASMFC Plan Amendment target rate resulting in less stringent harvest reductions for Massachusetts and Rhode Island than other more data-poor states to the south; an experiment was initiated to document shrinkage in length of summer flounder after icing and how it may effect enforcement of the minimum sizes; approximately 10,000 archived NMFS, NEFSC black sea bass age samples were read in preparation for a future age-based stock assessment.

The ASMFC striped bass and river herring stock assessment committees were chaired. Striped bass and river herring data were analyzed as needed, R computer programs were developed for

estimation of total mortality from length and age data, striped bass and menhaden monitoring reports were prepared, and the results of the striped bass, shad, and river herring assessments were presented to the ASMFC Management Board.

Work was initiated on the development of a predictive model to assess hooking mortality.

Striped Bass Recreational Fisheries Sampling

Work continued on the development of the Sportfish Angler Data Collection (SADCT) program and web-based fishing log book. Angler data from 2007 were entered into the database, compiled and analyzed, and a report was written and mailed to participating volunteer anglers. Preliminary statistical analyses were run on the 2008 SADCT data and the annual data report drafting was initiated.

Research was conducted on the development of an e-logbook including the creation of an execution plan and map; Striped bass temperature tag data was analyzed and summarized and a manuscript is in preparation.

Striped Bass Tagging, Age, and Growth

During 2008, 14 trips were made aboard contracted vessels and 456 striped bass tagged. Staff, volunteer anglers, and vessel captains were coordinated via daily phone and e-mails for all trips.

Eighteen market sampling trips were made to collect age and growth parameters from commercial catches; about 400 fish were sampled. Scale preparation and reading of commercial market, volunteer angler, tagging study specimens, and previously obtained samples for otolith age comparisons was completed.

Striped bass length/age/growth processing.

Tag insertion on striped bass

Tautog Age and Growth

A total of 305 fish were obtained through directed sea sampling and purchases from commercial fishermen. Opercula were obtained from most samples, cleaned, and read. Resulting age data were digitized and used to create an age/length key.

Smelt population sampling was undertaken with fyke netting to collect age and genetic samples and water quality parameters were measured. Smelt and environmental data from eight rivers located in the North Shore, South Shore and South Coast Zones were processed and analyzed.

Eel population sampling and passage enhancement involved eel sampling with Sheldon eel traps in the Jones, Parker, and Saugus Rivers to calculate a local abundance index.

Smelt Propagation and Stocking was undertaken including preparation of the laboratory for tank spawning of adult broodstock, hatching, marking and stocking of larvae, and analyzing and reporting of results.

Habitat and Access

Staff undertook monitoring, manning, and improving of Craven's Landing site in East Sandwich, a *MarineFisheries*' property, aquired in 1999 to facilitate access for fishermen. Communications with the property's neighbors and MEP staff were maintained regarding site rules enforcement. Improvements to the site included the procurement and installation of new fence rails, repainting of the memorial rock engraving, and printing and installation of new signage with an improved parking plan.

Recreational Fishing Derby

MarineFisheries' Saltwater Fishing Derby was administered including the digitizing of all entries, tracking of standings, and press releases. Winners were recognized with awards at the annual Worcester Sportsmen's Show in Worcester, MA.

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 subjected 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.

With the exception of trawl, longline, and gillnet fisheries that target spiny dogfish, there are no directed commercial fisheries for sharks in Massachusetts. Of the 2.8 million pounds of sharks landed in the Commonwealth in 2007, 99% were spiny dogfish (*Squalus acanthias*) with a commercial value of $637,000 (Table 2). The balance comprised unidentified dogfish (0.2%), shortfin mako (*Isurus oxyrinchus*, 0.2%), porbeagle (*Lamna nasus*, 0.1%), and unclassified sharks (0.6%) taken incidental to trawl, longline, and gillnet fisheries (Table 2).

Table 2. Estimates of 2007 commercial shark landings in Massachusetts

Species	Weight (lbs)	% Catch	Value ($)	Price/lb
Pelegic Sharks*				
Shortfin Mako	5,416	0.19	5,626	$1.04
Porbeagle	3,769	0.13	2,328	$0.62
Unclassified	17,779	0.63	13,274	$0.75
Dogfish				
Spiny Dogfish	2,796,250	98.82	637,223	$0.23
Dogfish	6,388	0.23	1,303	$0.20
Total	2,829,602		659,754	$0.23

*NMFS FMP Group;
Source: NMFS, Fisheries Statistics Division

A substantial recreational fishery for sharks occurs in Massachusetts from June through October each year. The most recent estimates from the National Marine Fisheries Service (NMFS) Marine Recreational Fishery Statistics Survey (MRFSS) indicate that Massachusetts' recreational fishermen caught about 1.05 million sharks in 2007, with spiny and smooth dogfish comprising 98% of the catch (Table 3). However, MRFSS data do not adequately reflect species composition, relative abundance, and temporal and spatial distribution of sharks and shark nursery habitat in these waters. In fact, the MRFSS failed to detect most of the shark species picked up by *MarineFisheries*' MSTMP (Table 3). The Massachusetts Sportfishing Tournament Monitoring Program (MSTMP) data indicate that of the 909 sharks caught during Massachusetts big game fishing tournaments in 2007, 725 (80%) were blue sharks *(Prionace glauca)*, 144 (16%) were shortfin makos, and 34 (4%) were common thresher sharks *(Alopias vulpinus)*; the balance included three sandbar and three dusky *(Carcharhinus obscurus)* sharks (Table 3); 96% of the sharks were released. 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 3. Estimates of 2007 recreational shark landings in Massachusetts from various sources

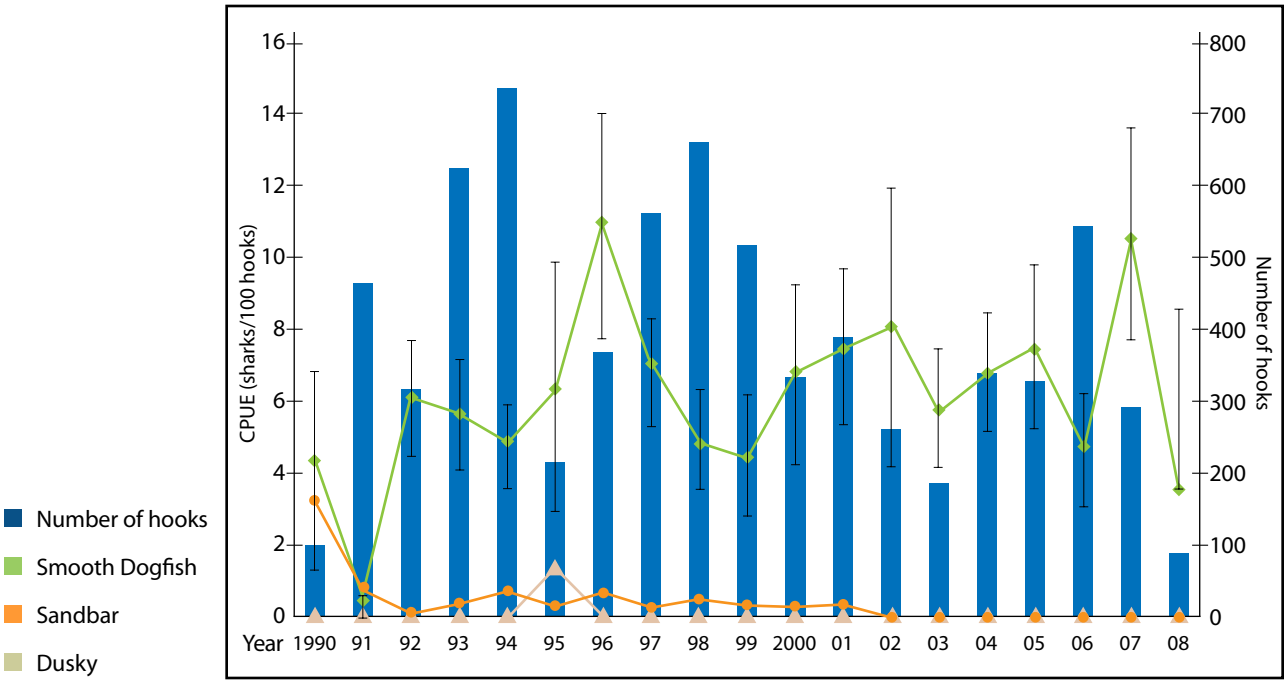
Species	Boated	Released	Tagged	Total	% Released	Weight (lbs)
MSTMP*						
Blue		718	7	725	100.0	
Shortfin Mako	18	123	3	144	87.5	1,858
Common Thresher	20	13	1	34	41.2	5,823
Sandbar	1	2		3	66.7	
Dusky		3		3	100.0	
Total	39	859	11	909	95.7	7,681
MRFSS**						
Spiny/Smooth Dogfish	19,253	1,036,373		1,055,626	98.2	13,093
Sand Tiger/ Sandbar/ Unidentified	552	11,258		11,810	95.3	
Total	19,805	1,047,631		1,067,436	98.1	13,093

*DMF Massachusetts Sportfishing Tournament Monitoring Program
**NMFS Marine Recreational Fishery Statistics (Source:NMFS, Fisheries Statistics Division)

Shark Longline Surveys

Eight longlines comprising 242 hooks were set in Plymouth Bay (n=6) and in Vineyard Haven Harbor on Martha's Vineyard (n=2) from July 30-October 7, 2008. In addition, 70 longlines were set in Buzzards Bay by University of Massachusetts (SMAST) graduate student Derek Perry who is studying the feeding ecology of smooth dogfish. The smooth dogfish was the only shark species caught on the 2008 longlines. Species-specific catch-per-unit-effort (CPUE) indices for the 19-year time series are shown in Figure 1 (Nantucket Sound data only).

Figure 1. Annual longline effort and shark CPUE, 1990-2008; smooth dogfish ±SE.



Outreach

The annual Anglers Guide and Regulatory Abstracts were updated, printed and distributed to over 100 bait and tackle shops and 30 similar venues in 2008 including the Worcester Eastern Fishing and Outdoors Exposition, Massachusetts Striped Bass Association Expo, the Rhode Island Saltwater Anglers Association Fishing Expo, New England Boat Show, Barnstable County League of Sportsman, Striper Forever, the Topsfield Fair, and the Cape Cod Salties.

Correspondence was conducted with anglers regarding the SADCT program and various sport fish species in general. In addition, a lecture on general linear models was given to graduate students at SMAST and R programming classes were taught to *MarineFisheries* staff.

Several collaborative shark research projects were continued or initiated with researchers from state and federal agencies, private institutions, and academia. These included studies on movement, nursery habitat, post-release survivorship, and feeding ecology.

Technical information on shark biology and management was provided to the public, dive and angler clubs, and other agencies through slide shows, interaction with the media, academia, and the federal and state management process.

Staff served on eight University of Massachusetts graduate student committees in 2008 and in a co-advisory role for three of these students.

Diadromous Fisheries Management and Restoration Project

Personnel:

Phillips D. Brady, Senior Marine Fisheries Biologist

Brad Chase, Senior Marine Fisheries Biologist

John J. Sheppard, Marine Fisheries Biologist

Kristen H. Ferry, Marine Fisheries Biologist

Edward Clark, Carpenter

Luis Carmo, Laborer

Sara Turner, Fisheries Technician

Daniel Syriala, Seasonal Technician

Josh Black, Seasonal Technician

Overview:

The diadromous fisheries management program is responsible for the management, investigations, and assessments of 18 species of diadromous fish stocks (fish that migrate between fresh and salt water) in Massachusetts. Facilitation, design and execution of restoration projects are undertaken with the goal of enhancing diadromous fish populations and habitats within the Commonwealth. Historically, diadromous 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 the state's popular game fish and coastal fishermen. Species such as river herring (alewife and blueback herring), rainbow smelt, white perch, tomcod, American eel and American shad are evaluated on the basis of stock size, local harvests, stock requirements, age composition, mortality rates, sex ratios, suitable spawning habitat, and restoration potential. Information generated via this work is essential in the development of sound management practices for these important species. It is compiled into technical reports with assessments and findings reflected in management recommendations for the approximate 100+ anadromous fish runs present along the Commonwealths coastal waters from the Rhode Island to New Hampshire borders.

Propagation

The ongoing effort to reestablish, augment and enhance natal anadromous runs in conjunction with ongoing fishway improvement projects, resulted in a total of 10,805 prespawning adult river herring trapped and transported via stocking truck into six coastal river systems throughout the Commonwealth. The six systems that received gravid fish this year were: Town Brook, Plymouth; Island Creek, Duxbury; Monument River, Bournedale; Three Mile River, Dighton; Ten Mile River, Seekonk; and Upper Mystic Lake, Arlington/Medford. In an effort to sustain small populations in two of Rhode Island's coastal systems, an additional 2000 alewife were trapped from a Massachusetts donor system and stocked in a cooperative effort with the state of Rhode Island. Restoration efforts for American shad in the Charles River system also continued with the introduction of 900,000 shad fry into the waters around the Woerd Avenue Boat Launch in Waltham.

Construction and Improvements to Passage Facilities

Construction and improvements were made at a total of thirty-five different fishways in 20 different river systems prior to the spring spawning migrations in 2008. Figure 1 shows the river system and town where construction and improvements were made.

Figure 1. MA river system and town where work was performed

Three Mile River	Dighton
Cockeast Pond Culvert	Westport
Nemasket River	Middleboro/Lakeville
Santuit River	Mashpee
Mashpee River	Mashpee
Pilgrim Lake	Orleans
Monument River	Bournedale
Grassy Pond Eel ramp	Harwich
Town Brook	Plymouth
Jones River	Kingston
Island Creek	Duxbury
Back River	Weymouth
Weir River	Hingham
Herring River	Pembroke
Charles River	Watertown/Waltham
Parker River	Newbury
Ipswich River	Ipswich
Little River	Gloucester
Muddy Creek	Chatham
Saugus River	Lynnfield

Two major reconstruction jobs were undertaken by the communities of Yarmouth and Sandwich following direct technical input and design review from the U.S. Fish and Wildlife Service and Marine Fisheries Anadromous Fish Management Program. The first project was the daylighting of a portion of the Parkers River at the Clear Brook Road Culvert in Yarmouth. This work removed a complete stream crossing and replaced an eight-foot weir pool fish ladder and three-foot culvert with a newly opened stream channel and enlarged resting/catch area for the fish before they continue upstream to their main headwater spawning area in Long Pond (57 acres).

The second job was the complete rebuilding of the Upper Shawme Pond dam in Sandwich, with the inclusion of a new Alaskan Steeppass fishway and American Eel ramp incorporated into the newly designed spillway. This effort will reestablish fish passage into the uppermost spawning area of the system, essentially doubling the potential spawning habitat and providing full upstream access for a fish run which has supported river herring harvest and management since the1800's.

New/Ongoing Projects under *MarineFisheries* lead include repair of a concrete weir essential to allow river herring access to the first step of the fish ladder at the Parker River, Newbury, however project development and higher than normal fall flow in the Parker River postponed construction until the summer of 2009; construction of a permanent eel ramp at Wankinco River, Wareham; efforts to work with the Town of Orleans and the Cape Cod Hook Fishermen's Association to repair the outlet structure and fish ladder at the Pilgrim Lake, Orleans. Project delays have pushed this construction to the dry season in 2009, when it will be done with assistance from the *MarineFisheries* fishway crew.

Ongoing *MarineFisheries* Technical Assistance

Potential restoration projects are reviewed upon request from local, state and federal agencies and interests. The assistance we provide ranges from brief technical advice to signing onto long-term projects as an active partner. Site visits and proposal reviews during the reporting period

lead to partnerships with new projects. In addition, routine assistance is provided upon request to potential projects in development in the form of site visits, proposal reviews, support letters and providing information on existing resources.

Additional work was generated through external requests to review various additional projects including: a stormwater remediation study in the Back River watershed, Town of Weymouth; flood control in the North River Peabody/Salem; a tidal restriction and potential river herring restoration at Sarah's Pond, Orleans; salt marsh restoration and alewife passage at Stoney Brook, Brewster; dredging wetlands at the site of a former dam impoundment with the goal of creating alewife spawning habitat; and a proposal by the Massachusetts Bays Program to establish a coordinated river herring counting program.

Biological Assessments: 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, Bournedale; Town Brook, Plymouth; Mystic River, Medford; Agawam River, Wareham; Wankinco River, Wareham; Mattapoisett River, Mattapoisett; Nemasket River, Middleboro; Merrimack River, Lawrence; and the Acushnet River, Acushnet. A total of 3,947 river herring and 202 American shad were sampled and assessed from seven of these nine coastal systems. Data indicates that river herring populations are experiencing a truncation in age structure, with fewer older fish being collected and a smaller average size at age observed than in past years. Electronic monitoring of several coastal systems indicated that there was a slight positive up-tick in the number of fish returning to their natal spawning grounds in 2008. Counts varied from approximately 10,000 fish in the Mattapoisett River, Mattapoisett to 850,000 in the Nemasket River, Middleboro.

Movement of diadromous species is monitored for the spring/summer period each year at the first obstruction on the Merrimack River in Lawrence, Massachusetts. Passage of American shad on the Merrimack River was up in 2008, with 25,116 fish lifted over the Essex Dam in Lawrence. This was a marked improvement over the 15,876 lifted in 2007, and the 1,205 lifted in 2006.

River Herring Habitat Assessment

An effort was initiated 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 MassDEP approved Quality Assurance and Program Plan (QAPP) for water chemistry and other measurements related to diadromous fish habitat. The intention was to develop protocols for assessing habitats that can interact with MassDEP's Surface Water Quality Criteria and contribute to MassDEP's Watershed Assessments. Efforts are underway to incorporate MassDEP's reviews of draft SOPs for temperature loggers, water chemistry sondes, and rainbow smelt and river herring spawning habitat assessment.

Monthly habitat assessments were made at the following four water bodies: Silver Lake, Jones River; First Herring Brook, Scituate; Great Pond Reservoir, Fore River; and Mystic Upper Lake, Mystic River. Each assessment includes partnering with the local watershed association. An exploratory site visit was made to Hathaway Pond, Marion, to discuss potential projects with the Coalition for Buzzards Bay and the process for conducting a habitat assessment in 2009.

Resource Assessment Project

Personnel:

Jeremy King, Senior Marine Fisheries Biologist

Vincent Manfredi, Marine Fisheries Biologist

Matthew Camisa, Marine Fisheries Biologist

Overview:

The Resource Assessment Project's mission is to collect and analyze relative abundance and biological data from marine species in Massachusetts' territorial waters for use in fishery management. These fish are sampled with an otter-trawl using standardized spring and fall surveys of the state's territorial sea. The surveys are timed to coincide with seasons when either adults or juveniles are available inshore. 2008 marked the completion of the 31st consecutive annual spring and fall trawl surveys and the 33rd consecutive annual seine survey.

An annual estuarine seine survey is also conducted to monitor spawning success of winter flounder in six estuaries on southern Cape Cod. A small mesh haul seine is used on the top half of the tide when winter flounder young-of-the-year are feeding in the intertidal and shallow subtidal zones.

2008 Spring Trawl Survey

From 5-23 May, 2008 the 31st spring bottom trawl survey was conducted aboard the R/V Gloria Michelle. 103 stations were completed in sixteen sampling days. To aid cooperative fisheries assessments, over 1,900 scale/otolith samples, as well as sex and maturity observations, were taken from Atlantic cod, haddock, witch flounder, summer flounder, yellowtail flounder, winter flounder, windowpane flounder, black sea bass and scup. External pathology was monitored on nearly 300 flatfish. Considerable effort was expended processing more than 370 specimens of designated species to fulfill requests from federal, state, and university scientists, including approximately 140 winter flounder, 130 alewives, 45 blueback herring, 6 American shad, and various other species.

2008 Fall Trawl Survey

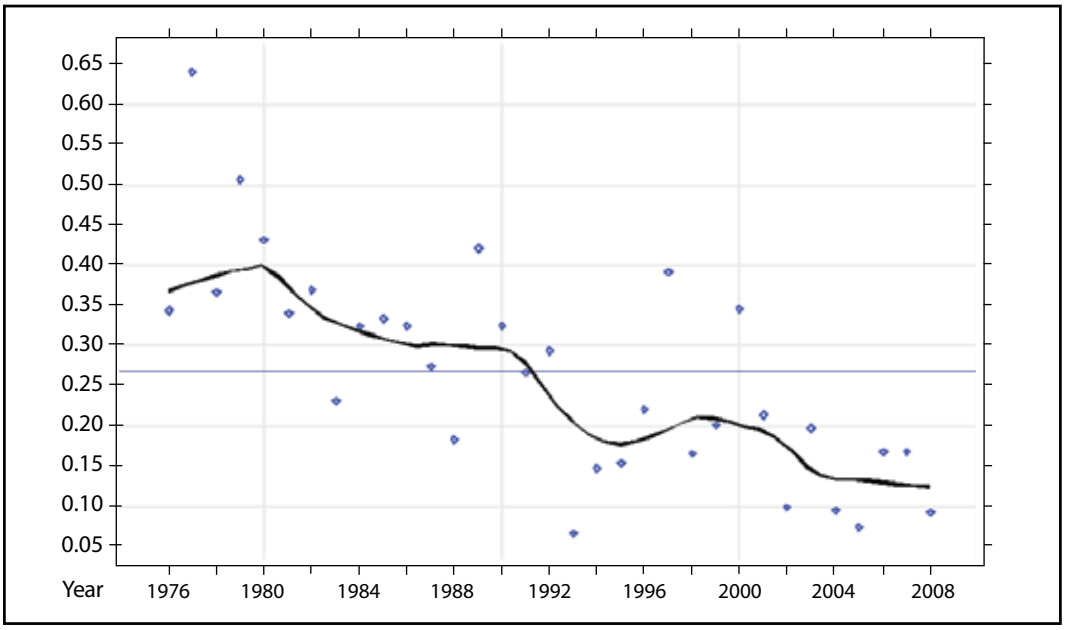
From 2-20 September, 2008 the 31st fall bottom trawl survey was conducted aboard the R/V Gloria Michelle. 101 stations were completed in sixteen sampling days. To aid cooperative fisheries assessments, over 1,550 scale/otolith samples, as well as sex and maturity observations, were taken from Atlantic cod, haddock, American plaice, summer flounder, yellowtail flounder, winter flounder, windowpane flounder, black sea bass and scup. Sex was determined on all yellowtail flounder and summer flounder on deck. External pathology was not monitored on flatfish species to allow additional time for the enhanced yellowtail and summer flounder sampling. Considerable effort was expended processing more than 750 specimens of designated species to fulfill requests from federal, state, and university scientists, including approximately 400 lady crabs, 150 rainbow smelt, 88 black sea bass, 54 northern pipefish and various other species.

2008 Seine Survey

From 16 June – 3 July, 2008, staff conducted the 33rd Nantucket Sound Estuarine Winter Flounder young-of-the-year (YOY) Seine Survey. The primary objective of this survey is to provide a winter flounder YOY abundance index for the Southern New England Stock. All commercially and recreationally important finfish and invertebrates are counted. All species not counted are noted for presence. The pooled (all estuaries combined) winter flounder YOY index dropped to 0.092 YOY / m2 in 2008. This index represents the third lowest in the 33 year

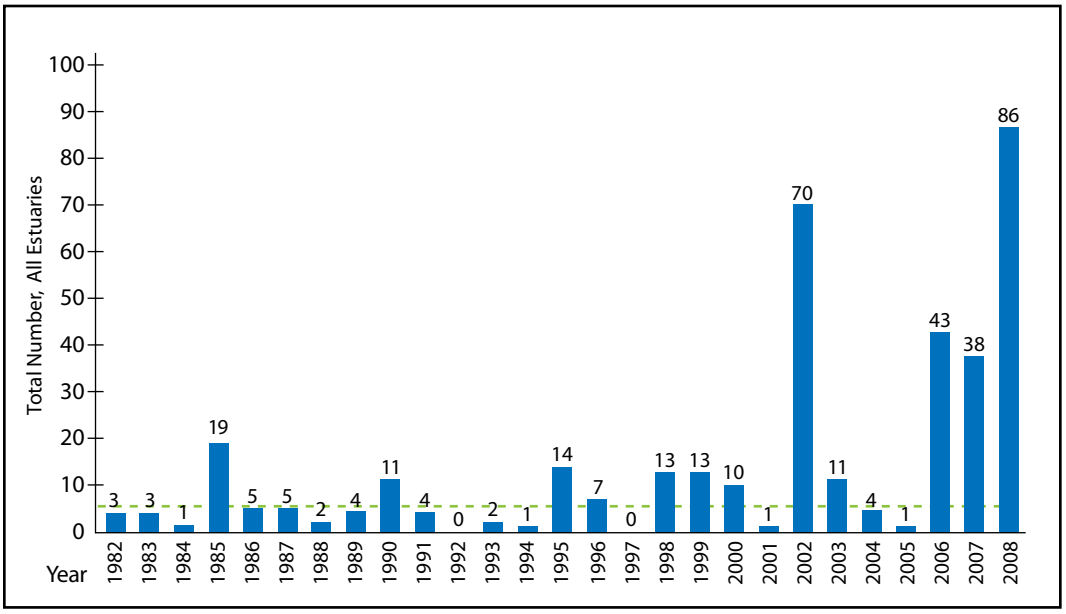
timeseries, surpassed only by lows in 1993 and 2005, and is the eighth consecutive year below the timeseries median (Figure 1).

Figure 1. YOY Winter Flounder, *Pseudopleuronectes americanus*, 1976-2008.



Eighty-six YOY summer flounder were caught among all estuaries in 2008, representing the greatest area-wide catch on record and third consecutive high count (Figure 2).

Figure 2. YOY Summer Flounder, *Paralichthys dentatus*



A total of 42 species were encountered in seine hauls. Smallmouth flounder, *Etropus microstomus*, were recorded for the fifth year in the timeseries; 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. Another observation of note is the record high catch of spot, *Leiostomus xanthurus*. Two-hundred and seventeen spot were captured at 8 stations, representing the highest occurrence ever.

Assessment Support

Survey indices were partitioned into component age classes for: Southern New England and Gulf of Maine (GOM) stocks of Winter Flounder, Cape Cod/GOM yellowtail flounder and GOM Atlantic cod. These were contributed to assessments reviewed at the *3rd Groundfish Assessment Review Meeting (GARM III), Northeast Fisheries Science Center, Woods Hole, Massachusetts, August 4-8, 2008.*

Aged survey indices were also generated for summer flounder and provided to the lead fluke assessment biologist for the *47th Northeast Regional Stock Assessment Workshop*, Northeast Fisheries Science Center, Woods Hole, Massachusetts, June 16 -20, 2008.

Survey data and/or graphics were provided to assessment scientists in support of ASMFC assessments and/or compliance reports for numerous ASMFC-managed species including: Atlantic herring, black sea bass, bluefish, horseshoe crab, lobster, scup, summer flounder, tautog, weakfish, and winter flounder.

The survey trawl's door and wing spread measurements (calculated during operartion) were prepared for use in converting number/tow and weight/tow indices to minimum swept area estimates to allow direct interpretation of the catchability estimates associated with each survey and age combination.

Ocean Management

Trawl survey data played a prominent part in the fisheries workgroup portion of the Ocean Management Plan development for Massachusetts. Optional ways to present it were evaluated. Also, methods were explored to identify species that exhibit particular preference/dependence on select depth strata which may have restricted habitat associations in an Ocean Management planning area.

Other Assignments

In March 2008, J King joined the 'Demersal Fish Technical Team' of the North Atlantic Marine Ecoregional Assessment (NAMERA) led by The Nature Conservancy (TNC). The goal of the ecoregional assessment is "…to produce a marine ecoregional assessment to serve as a blueprint for biodiversity conservation within the Northwest Atlantic Marine Ecoregion…" J King has participated in review of methods of analysis and data presentation, largely based on trawl survey data, utilized in building this assessment.

At the request of the ASMFC, J King completed a literature and data review for evidence of habitat associations for spiny dogfish. A matrix of habitat associations by life stage, as well as notes and a bibliography to support matrix scores was provided to ASMFC for their Atlantic Coast Fish Habitat Partnership (ACFHP) effort.