Overview

The guiding philosophy for New Hampshire Sea Grant (NHSG) is to serve our constituency by supporting innovative and cutting-edge research integrated with expert extension outreach and education to support dialog and science-based decision making in areas of particular importance to our region. In so doing, we seek to promote the wise use, development and conservation of northern New England's coastal and marine resources. Since 1970, NHSG has established itself as a leader in developing solutions to critical issues and as an unbiased source of information and expertise rather than an advocate for any one particular solution. While NHSG is considered a "small" program within the National Sea Grant College Program in terms of core federal support, our successful efforts to obtain significant leveraged funding and to build and strengthen strategic partnerships between the state's universities, agencies, non-governmental and private sectors enhance the effectiveness and public value of our programs across the state and in the region. Through these efforts, NHSG has established a high quality and impactful program that was recognized as "remarkably efficient and effective," "highly integrated within the National Sea Grant Community," and "a highly-valued, trusted, and sought-after source of expertise, research and resources" in our 2015 Site Review Team report.

Although New Hampshire has just over 18 miles of Atlantic coastline, the state's two major estuaries, Great Bay Estuary and Hampton-Seabrook Harbor, have nearly 220 miles of estuarine shoreline that provide commercial and recreational opportunities for state residents. Thirty-two percent of the state's 1.35 million people live within two coastal counties and nearly 75% of those individuals live within 50 miles of the coast. The state's and region's economy and culture are closely tied to the nearly 4,500 miles of coastline and the wealth of marine resources found within the Gulf of Maine. Over the past decades, N.H. and the Northeast have been faced with both environmental and social challenges that are impacting land use, water quality and natural resource management decisions that in turn have affected the resilience of our coastal ecosystems, communities and economy. NHSG has been a leader in addressing these challenges. Every four years, NHSG staff work with our stakeholders and through our Policy Advisory Committee to identify research, extension and education priorities and develop our strategic plan. NHSG's strategic priorities align strongly with the National Sea Grant focus areas in healthy coastal ecosystems, hazard resilience in coastal communities, safe and sustainable seafood supply, sustainable coastal development and marine literacy. The impacts and accomplishments provided in our focus area summaries and PIER reporting reflect the important scientific and societal contributions NHSG has made in meeting the goals of our strategic plan.

During this review period, NHSG had to re-align its strategic planning cycle to the new national schedule. As a result of this and limitations in PIER, our reporting is aligned with the NHSG 2011-2013 Strategic Plan (these priorities are consistent with our previous 2007-2011 plan). In preparation for this Performance Review Panel (PRP) we were asked to select 80 of the 320 impacts and accomplishments we reported during 2010-2013. While we have done our best to represent the breadth and quality of our impacts in these materials, there are significant items that we believe we have not been able to fully present in the new, more limited, format. The following Summary Report is intended to augment the information provided in the PIER report and provide examples of how NHSG effectively integrates our research, extension, education and communications programs and engages our partners to address the strategic goals of greatest importance to our stakeholders, the state and our region.

Safe and Sustainable Seafood Supply

Situation – The total economic activity generated from New Hampshire's commercial fishing industry – primarily composed of lobstermen and groundfishermen and supporting 5,000 full- and part-time jobs – was $106 million in 2009. During the 2010-2013 period there were unprecedented changes in the markets, ecosystems and management structures that support commercial fishing in the Gulf of Maine, resulting in significant impact on N.H. fishermen. According to the National Marine Fisheries Service (NMFS), 180 N.H. boats had commercial permits in 2009. This number dropped by about 50% from 2009 to 2010, while the value of N.H.'s landings decreased by 40%. As a result, the N.H. industry has seen consolidation to a smaller number of boats with more allocation for annual catch sold to out-of-state permit holders.

Of particular significance to N.H. groundfishermen was the dramatic overhaul of Northeast groundfish management that occurred in 2010 when days-at-sea management was essentially replaced by a sector-based management system. Although several stocks, such as Atlantic haddock, pollock and Acadian redfish, have improved in stock size in recent years, key groundfish stocks such as Gulf of Maine Atlantic cod, a stock that recently appeared to be on a positive trajectory, are now considered overfished and to be experiencing overfishing based on a pivotal 2012 stock assessment.

The sector model allows fishermen to self-organize in groups that agree to fish under strict limits on catches of all groundfish stocks in exchange for being free from many of the at-sea restrictions that were the foundation of the Days-at-Sea program. Under sector management, fishermen are required to stop all groundfishing once they reach their limit for *any* groundfish stock during a fishing year. This system creates opportunities for fishermen to time their fishing based on market behavior, but also leaves them vulnerable under conditions such as those beginning in 2013 when one stock is depleted and is difficult to avoid catching while fishing for allocations of other stocks. At the same time, other factors continue to challenge fishing businesses, such as the degradation of estuarine and coastal ecosystems essential to a vibrant fishery, eutrophication, habitat degradation, climate change, and the influx of low-cost imported seafood that has displaced domestic seafood in the region's commercial markets.

N.H. Sea Grant's Response – Theses changes and pressures have seriously challenged the continued survival of the local fishing industry and have motivated rich and diverse extension and research programming at N.H. Sea Grant (NHSG) to help sustain local ecosystems and fishermen. In alignment with its SSSS strategic goals, NHSG has undertaken a broad suite of activities to help ensure that N.H. and the region continue to support a healthy domestic seafood industry with the capacity to adapt to the dynamic regulatory environment and changing marine ecosystems on which it is dependent. N.H. Sea Grant extension specialists and NHSG-funded researchers have focused on efforts to improve the effectiveness of science and management in conserving marine ecosystems while helping fishermen and fishing communities adapt to stresses imposed by marketplace, ecological and management trends. To that end, NHSG-funded researchers authored 20 peer-reviewed journal articles in the SSSS focus area during 2010-2013 that have been cited 195 times to date.

While many challenges constrain wild fisheries, economic opportunities continue to emerge for developing sustainable aquaculture practices for local and regional entrepreneurs and fishermen looking to diversify their income sources. Through extension and research, NHSG has been a leader in the development of sustainable aquaculture production that has expanded business opportunities and provided positive environmental impacts on nutrient-impaired ecosystems in the state.

Outcomes – In working with fishing communities and economies, NHSG provides the best available research and information and helps those in the fishing community apply the information to their own priorities with as much comfort and confidence as possible. The ultimate outcomes of NHSG's efforts in supporting a healthy domestic seafood industry focus on working with individual fishermen, local businesses and cooperatives to increase comfort with new technologies (e.g., selective gear and aquaculture techniques), help develop alternative markets, and assist the fishing community to navigate rapidly changing regulatory environments.

The following four inter-related themes show examples of how NHSG integrates our research and extension efforts to address our strategic goals in safe and sustainable seafood supply and provide positive impacts to our local and regional fishing communities, and illustrate NHSG's role in generating outcomes with its partners to address coastal stakeholders' needs. Many of these outcomes would not be possible without NHSG's commitment to integrated, cross-disciplinary endeavors.

Modifying Gear and Innovating on the Water

Between 2010 and 2013, NHSG was active on both a local and regional scale to develop and transfer gear and vessel technology with economic and ecosystem value to Gulf of Maine fishermen. NHSG staff facilitated the flow of information and ideas among fishermen, managers, scientists, non-profit organizations and gear technologists, participated in scientific testing of proposed gear modifications, and developed and implemented approaches to transfer modifications to the industry. Staff also worked closely with fishermen to assess needs and identify opportunities to move commercial fishermen toward sustainable fishing practices and to entrain resources, expertise, capacity and strategic planning to develop programming that targets clearly defined goals.

As an example, beginning in 2011, NHSG helped local fishermen develop and test an approach to avoid cod while targeting more abundant but commercially valuable species. N.H. Sea Grant partnered with N.H. Groundfish Sectors to write a successfully funded proposal, plan and implement field work and experimentally test a **modified gillnet** designed to avoid cod while targeting more abundant species, such as pollock, by raising the footrope of the net several feet off the seabed. The idea for the raised gillnet was a fisherman's, brought forward at a sector meeting facilitated by NHSG staff. The NOAA Northeast Region Cooperative Research Program funded the project and results have been promising. N.H. Sea Grant is now working to extend the program so that more fishermen in the Northeast can test the nets in the hope of speeding industry adoption of the modification.

N.H. Sea Grant also helped fishermen enter an emerging shrimp fishery using conservation methods that protect non-target species and shrimp age classes from capture during harvest. The shrimp fishery is particularly valuable to N.H. and other regional fishermen because it provides an economic opportunity during the winter, which is normally a slow period for in-shore, smaller vessels. The reappearance of robust northern shrimp stocks could translate into increased economic benefits and stability for harvesters and processors. **Several strategies or devices were developed by NHSG** and UNH researchers that significantly enhance size selectivity of shrimp and have been shown to reduce the catch of non-target species to less than 3% of the total catch. N.H. Sea Grant identified two strategies in particular for transfer to the industry: the dual-grid system and the non-parallel grate. Since 2005 when NHSG started technology transfer efforts, and continuing through 2013, this gear has been adopted by 46 fishing boats from Maine, N.H. and Massachusetts representing approximately 40% of the fleet.

Developing Aquaculture Methods and Transferring Technology

To foster development of aquaculture production and business activity, NHSG advises, educates, and participates in methodological development alongside fishermen and aquaculture entrepreneurs. N.H. Sea Grant's role includes species selection, site evaluation, permitting, and developing and implementing experimental and demonstration programs for growout technologies and marketing. Species include oysters, mussels, kelp and steelhead trout. In addition, NHSG works with regulatory agencies to improve permitting processes and reporting that creates efficiencies in the aquaculture industry. N.H. Sea Grant extension staff organized workshops to update farmers on policy changes, technology and general information, and presented the benefits of shellfish farming, including nutrient uptake from the environment and the production of sustainable, healthy seafood, at local, regional and national forums.

Between 2009 and 2013, N.H.'s oyster farming industry grew from one to eight farms. This rapid growth stemmed from **changes in the regulatory process that NHSG helped establish**. The changes placed a lead agency (N.H. Fish & Game) in charge of aquaculture permitting and increased lease holds from one to five years. As a result, over six million oysters are now growing in the estuarine waters of N.H. valued at over $4 million. More than 20 people are now employed part- or full-time in growing, harvesting and transporting fresh oysters. The filter feeding oysters have environmental value, extracting nitrogen from Great Bay at a value of more than $1 million per year.

To provide fishermen an opportunity to diversify and learn a new skill set, NHSG and UNH have been investigating small-scale, **multi-trophic (multi-species) aquaculture** (IMTA) in a local river, integrating the production of steelhead trout with blue mussels and sugar kelp that extract nitrogen from the water. The IMTA model was adopted due to EPA concerns about adding nitrogen from fish feed to the already nitrogen-impaired river. In the last three years, the IMTA project has trained more than 10 fishermen who have produced and sold the three species, and the nitrogen extraction by the mussels and kelp exceeded the nitrogen input from the trout. Information gained from the project is being used to modify the current classification of the aquaculture site, and this model has been adopted by EPA and state regulatory agencies.

In addition, researchers funded by NHSG and Connecticut Sea Grant developed the technology necessary to establish **commercial-scale seaweed nurseries** for incorporation into fish and/or shellfish aquaculture operations to remove excess nutrients from the water while providing consumers with locally grown sea vegetables. This innovative approach balances nutrient flow in a way that facilitates permitting in nutrient-sensitive locations and represents a significant opportunity for our region to realize the economic potential offered by sustainable aquaculture practices.

N.H. Sea Grant also funded research supporting development of protocols for alewife and winter flounder culture for both fish production and stock enhancement purposes and led a training program for fishermen to transfer small-scale steelhead trout aquaculture production and marketing methods designed to complement their wild-caught fishing operations.

As shellfish aquaculture production increases in N.H. estuaries, so does the need to proactively understand pathogenic marine organisms. N.H. Sea Grant has taken a leadership role by supporting research to use genetic analyses to map the population structure of bacterial Vibrio strains to determine the potential for genetic exchange between pathogenic and nonpathogenic strains. Vibrios are a group of naturally occurring bacterial organisms, several of which are known to be pathogenic to humans who come into contact with or consume them with shellfish. While conducting research on bacterial Vibrio species found in N.H.'s Great Bay Estuary, NHSG-funded researchers found the **first documented strains of *Vibrio cholerae***, a pathogenic species that famously causes the disease cholera. Although strains found here are incapable of causing cholera, these strains were associated with oysters and may cause gastroenteritis. The discovery is the northernmost documented occurrence of this species, and it will serve as an important model for understanding niche expansion and adaptation, particularly as climate change impacts the local ecology.

Improving Local Seafood Marketing and Fishing Business Best Practices

Between 2009 and 2013, NHSG established and developed a program to support alternative markets for seafood in a variety of innovative and engaging ways that take into consideration the producers of local seafood products, purveyors of those products, and consumers.

N.H. Sea Grant funded academic research that focused on the potential for local seafood marketing to supplement and add value to local fishermen and fishing businesses. This **survey-based research** found that consumers were interested in purchasing local seafood at a higher price than other seafood and identified demographics and geographical areas where market potential is highest for development of alternative markets. The results also highlighted the opportunity for local businesses to develop value-added seafood products in order to deliver higher profits to fishing vessels and associated dock-side businesses.

Based in part on this research, Sea Grant extension staff worked to **connect N.H. fishermen with their customers** using social media, value-added product development, and seafood branding efforts. By increasing awareness and knowledge about local seafood and the fishermen who harvest in N.H. waters, NHSG worked to meet the needs of seafood consumers for fresh and local product while at the same time encouraging fishermen to think "outside the box" and access different revenue streams such as lesser-known but still plentiful species of fish that are

often cheaper, more sustainable and equally flavorful alternatives to the better-known species. N.H. Sea Grant extension staff have worked with NHSG communications staff and the fishing community to explore and develop new markets for "underutilized" fish species by developing partnerships with restaurants, farmers markets and fishermen, and increasing public awareness.

Programming in this area accelerated in 2009 when the N.H. Commercial Fisherman's Association (NHCFA) and the Yankee Fishermen's Cooperative partnered with NHSG and local seafood groups, restaurants and fish markets to **develop a local brand for N.H. seafood**, NH Fresh and Local Seafood. In addition to this collaboration, NHSG facilitated the inclusion of fishermen in local winter and summer farmers markets by building partnerships between the agriculture and fishing industries. Since its unveiling in 2009, over 35 seacoast businesses have become partners with the brand. In 2013, NHSG worked with NH Fresh and Local Seafood partners to host a Local Seafood Kickoff event that featured tastings of several underutilized species offered by local chefs. The event was followed by informational booths and educational events at farmers markets, festivals and restaurants throughout 2013.

In 2012, NHSG extended its programming in local seafood marketing to a national level when it hosted a **National Community Supported Fishery Summit** attended by members of 21 CSFs from nine states and two Canadian provinces as well as representatives from NOAA, the National Sea Grant Network and non-profit groups.

Local and regional work with local fishing businesses continued with participation in the Regional Lobster Trade Adjustment and Assistance Program, a USDA training and financial assistance effort designed to help fishermen who have experienced revenue decreases due to foreign imports. In 2011, workshops were held in N.H. both in-person and online.

Supporting Fisheries Science to Inform Fisheries Resource Management

Stock assessments are critical to fisheries resource management. Between 2010 and 2013, NHSG has invested significantly in **research to improve stock assessment for lobster, groundfish, alewife, and shad** with important management implications.

The American lobster fishery, valued at close to $400 million annually in New England, is managed based on abundance estimates from standard lobster traps. N.H. Sea Grant funded research to determine if the new ventless traps that retain more lobsters also provide more accurate estimates of natural lobster populations than the standard traps. Using underwater video cameras, researchers captured footage to determine trap catch per unit effort, time to saturation, lobster density and size for both types of traps deployed in N.H. and southern Maine. Researchers determined that ventless traps provide a more accurate estimate of natural lobster populations than standard traps.

Abundance estimates may also be influenced by potential sperm limitation in the lobster fishery. The egg-per-recruit fishery model is used to estimate annual recruitment, and thus overall fishery trends, by calculating the number of eggs a female will produce. However, NHSG-funded research determined that this model may overestimate the total fecundity of females if there is a

limitation in sperm. More than 70% of the female lobsters sampled from New England waters had mated successfully, and many of those were smaller than the currently accepted size at which half of all females are sexually mature. This indicates either immature females are mating or there has been a change in the size at maturity.

As a follow-on to this research, researchers funded by NHSG have developed a fluorometric method to obtain measurements of total egg DNA to determine if American lobster eggs have been fertilized or not. This methodology will help to make a more accurate assessment of the proportion of female lobsters that will actually contribute new recruits to the fishery. The results from all of these studies will influence the estimates of lobster reproductive biomass in New England waters and the way the fishery is managed.

As noted, Atlantic cod populations experienced a collapse in the Gulf of Maine in the mid-1990s and again in the early 2010s. Cod stocks have suffered in part due to an inadequate understanding of cod population structure and dynamics and poor linkages between science and management. Using Sea Grant funds, researchers demonstrated the superior capacity of **multi-beam sonar** to identify the acoustic signature of cod and estimate cod population abundance and distribution compared to single- or split-beam echo-sounders and trawl-based surveys. Based in part on water surveys using these methods, the National Marine Fisheries Service established a cod spawning closure, prohibiting all fishing during the spawning season in the Whaleback area of the Western Gulf of Maine.

N.H. Sea Grant-funded researchers also **digitized and extracted historical data** regarding alewife and shad populations, harvest areas and gear from the 19th and 20th centuries. Analytical models to determine the ecological and economic role of forage species in the Gulf of Maine have been developed based on these data. Gulf of Maine fisheries managers have also used the data to develop new methods of estimating species abundance and distribution. Several non-government and research groups have incorporated the long time-series and spatial distribution patterns of alewives generated by this project into scenario-building models of nearshore ecosystems and coastal economies in the Gulf of Maine. In addition, the University of Maine's Diadromous Species Restoration Research Network has used these data to explore analytical techniques, such as variability analysis, to estimate changes in abundance of Maine alewives and other diadromous species over time. The research has also revealed the importance of fish ladders in helping to sustain alewife populations and weir harvest practices until offshore landings became significant in the 1950s. Most models for estimating production of alewives focus solely on large rivers, yet this research shows the significant contribution that small streams have to overall alewife population estimates. Based in part on this NHSG-funded research, the PI wrote a book published in 2012 that received four prestigious awards.

PIER PRP Program Focus Area Report

New Hampshire Sea Grant

Safe and Sustainable Seafood Supply

Program Focus Area: SAFE AND SUSTAINABLE SEAFOOD SUPPLY

Program Goals

1. A healthy domestic seafood industry that harvests, produces, processes and markets seafood responsibly to meet public demand.
2. A resilient fishing community with the capacity to adapt to a dynamic regulatory environment and changing marine ecosystems.

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Full Text of Impacts
Program Performance Measures
Objectives

Impacts and Accomplishments toward Program Goals

1. **Program Goal: A healthy domestic seafood industry that harvests, produces, processes and markets seafood responsibly to meet public demand.**
   Impact(s)
   - 21807 - Lobster gear removal restores coastal habitats in N.H.
   - 21664 - Shellfish aquaculture contributes over $1M in ecosystem services to Great Bay Estuary
   - 18774 - Vibrio research at UNH leads to formulation of control plans to protect human health and preserve shellfish businesses
   - 18699 - N.H. restaurants serve dogfish and educate customers based on feedback from consumer preference surveys
   - 18698 - Wholesaler incorporates N.H. Sea Grant research into business model for local seafood
   - 18572 - Multi-species aquaculture industry continues to grow in N.H.'s Piscataqua River
   - 18571 - N.H. oyster aquaculture industry generates jobs and reduces pollution
   - 18280 - N.H. Fresh and Local Seafood direct marketing campaign links fishermen with consumers
   - 16883 - Newly Developed Seaweed Aquaculture Methodologies Incorporated into Vocational School Training
   - 16730 - N.H. Sea Grant Researchers Develop Protocols for Alewife Culture that Lead to Direct Economic Benefits
   - 15503 - N.H. Sea Grant Research on Forage Fish Records Helps Guide Gulf of Maine Population Models
   - 15470 - Multi-trophic Aquaculture Raises Profits while Reducing Pollution
   - 14010 - Multi-beam Sonar Enhances N.H. Sea Grant Studies of Cod Abundance

   Accomplishment(s)
   - 21805 - N.H. Sea Grant's Doyle Fellowships provide summer opportunities for undergrads with marine interests
   - 18562 - Lab analyses characterize arsenic species in New England seaweeds
   - 18539 - Research indicates immediate need for seafood niche market development to help N.H. groundfishermen remain in business
   - 18531 - Survey indicates N.H. consumer interest in purchasing local seafood
   - 18514 - N.H. pathogenic Vibrio research leads to development of monitoring programs and detection methods in neighboring states
   - 17041 - N.H. Sea Grant-funded Efforts Lead to Mass-production of Winter Flounder for Stock Enhancement
   - 16880 - Model Created by N.H. Sea Grant Researchers Predicts Greater Numbers of Non-native Tunicates in Gulf of Maine Waters
   - 16859 - N.H. Sea Grant Research Indicates Fish Retailers, Restaurants Willing to Sell Underutilized Seafood Species
   - 16721 - N.H. Sea Grant Leads National Community Supported Fisheries Summit
   - 15453 - NHSG Guides Development and Coordination of Regional Lobster Trade Adjustment and Assistance Program
   - 15451 - Green-Fit Program Seeks to Increase Efficiency of Fishing Boats
   - 14021 - 30% of Northeast Shrimpers Using Conservation Technology

2. **Program Goal: A resilient fishing community with the capacity to adapt to a dynamic regulatory environment and changing marine ecosystems.**
   Impact(s)
   - 21811 - N.H. fishermen use innovative marketing to help themselves

- 21810 - N.H. Sea Grant helps fishing cooperative reduce costs and open marketing opportunities with data management system
- 16722 - N.H. Sea Grant Helps Fishermen Sustain the Industry with Innovative Gear
- 15503 - N.H. Sea Grant Research on Forage Fish Records Helps Guide Gulf of Maine Population Models
- 15470 - Multi-trophic Aquaculture Raises Profits while Reducing Pollution
- 14010 - Multi-beam Sonar Enhances N.H. Sea Grant Studies of Cod Abundance

Accomplishment(s)

- 21809 - Book based on historic fish population research funded in part by N.H. Sea Grant receives prestigious awards
- 18672 - American lobster research in N.H. leads to natural resources employment opportunity
- 18565 - Favorable winter flounder nursery habitats identified by N.H. Sea Grant researchers using fish growth and condition indices
- 18500 - Lobster bait deterioration reduces catch after one day in N.H. study
- 18285 - N.H. Sea Grant helps establish the Fisheries Extension Network Council
- 16866 - N.H. Sea Grant Researchers Calculate First Estimate of Spring-spawning Cod Biomass in Ipswich Bay
- 16858 - Surveys Characterize Consumer Seafood Preferences in New Hampshire's Seacoast
- 15453 - NHSG Guides Development and Coordination of Regional Lobster Trade Adjustment and Assistance Program
- 15451 - Green-Fit Program Seeks to Increase Efficiency of Fishing Boats
- 14021 - 30% of Northeast Shrimpers Using Conservation Technology

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Full Text of Impacts and Accomplishments

21811 - N.H. fishermen use innovative marketing to help themselves
Relevance: With the transition from days-at-sea groundfish management to the current sector allocation system, the small fishing fleet in Maine, N.H., and Mass. has suffered economically. New Hampshire fishermen are challenged by dynamic and unpredictable markets and management that requires strategies that maximize the value of harvestable stocks and increase local awareness of the seafood industry. This, combined with an increasing interest among consumers for local, sustainably harvested and fresh seafood, creates opportunities for the state's commercial fishermen.

Response: NHSG worked with the commercial fishing industry to diversify and pursue innovative marketing strategies to sustain the industry's operations, facilitating legal, marketing and business expertise. With the development of community supported fisheries (CSF) for fish and shrimp in 2010, an innovative CSF characterized by cooperative ownership by 14 fishermen members with input from consumer members in 2013, the new N.H. Fresh and Local seafood brand, and marketing seafood at farmer's markets, fishermen have increased the availability of locally harvested seafood to consumers. Extensive outreach efforts by NHSG provided outreach and educational information on the catch and fishing practices to thousands of shareholders and winter farmers market attendees.

Results: More than 1,450 people participated in fish and shrimp CSFs. New markets allowed for a significant increase in the amount of locally harvested northern shrimp that were sold, valued at $1.60 per pound when sold through direct marketing channels compared to $0.50 per pound by wholesaler. The CSF formed in 2013 completed three seasons of delivering weekly shares to 250 consumer members and sold local seafood at winter farmers markets to over 5,000 consumers. The CSF sold 8,000 pounds of locally harvested seafood at 25 cents over the auction price (for $2,000 additional revenue to boats). In addition, 36 businesses on the N.H. seacoast became N.H. Fresh and Local brand partners from 2010 to 2013.
RECAP: N.H. Sea Grant worked closely with the commercial fishing industry and local partners to coordinate and implement new marketing strategies that provided economic benefits to fishermen and fresh, local sources of seafood to consumers. Back to Goals

21810 - N.H. Sea Grant helps fishing cooperative reduce costs and open marketing opportunities with data management system
Relevance: Fishing communities are burdened with vast reporting and business management requirements. This burden is amplified by inherent inefficiencies in the reporting requirements and the traditional business management software available to fishermen and related fishing businesses. In addition, fishermen are increasingly bearing the costs for traceability initiatives imposed by retail and other outlets that realize profits based on "the story of the catch." To achieve sustainable fisheries and fishing communities, it is critical for fishing businesses to improve the efficiency of their business management and reporting mechanisms while capturing the value of the story of the catch. All of these problems can be addressed by improving data management processes that begin on the dock when fishermen land their catch.

Response: In 2012, N.H. Sea Grant partnered with the Yankee Fishermen's Cooperative (YFC) of Seabrook, N.H., Red's Best Seafood of Boston, Mass., and the N.H. Groundfish Sectors to overhaul the YFC business management software with technology developed by Red's.

Results: Using their new data management system, Yankee Fishermen's Cooperative is now saving four to six person-hours each day fish are landed, saving $26,500 during 2012 and 2013. The system automatically delivers dealer reports to the NOAA Fisheries Service with the touch of a button, and it also delivers catch and sales data to accounting spreadsheets. The system allows YFC to redirect some of its labor to innovative marketing approaches and can also apply a barcode and traceable branding to the boat for its catch.
RECAP: N.H. Sea Grant has partnered with local fishermen to improve the efficiency of their data management and reporting, opening the door to innovative marketing approaches, including local branding and delivering a completely traceable seafood product to the market place. Back to Goals

21809 - Book based on historic fish population research funded in part by N.H. Sea Grant receives prestigious awards
Based in part on his N.H. Sea Grant-funded research analyzing 19th century fishing records to help establish baselines and time series for rebuilding anadromous fish populations and coastal ecosystems in the Gulf of Maine, W. Jeffrey Bolster wrote "The Mortal Sea: Fishing the Atlantic in the Age of Sail" about the impacts of fishing on the North Atlantic ecosystem over the last four hundred years. The book, published by Harvard University Press, received four prestigious awards in 2012 and 2013: the Bancroft Prize from Columbia University, one of the most distinguished academic awards in the field of history; the Albert J. Beveridge Award given by the American Historical Association for "the best English-language book on American history from 1492 to the present;" the James A. Rawley Price in Atlantic History, given by the American Historical Association "to recognize outstanding historical writing that explores aspects of integration of Atlantic worlds before the 20th century;" and the North American Society for Oceanic History's John Lyman Book Award in the U.S. maritime history category. The book was also named to Choice magazine's list of Outstanding Academic Titles in 2013, reflecting the best scholarly titles reviewed by Choice, which specializes in reviews of academic books. Continued praise for The Mortal Sea indicates a wide-reaching interest in this topic, helping to educate the public about historic fish populations and put current stock structures into historic context. The Mortal Sea provides both the general public and scientists with a thorough overview of long-term fisheries trends and impacts from humans.

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21807 - Lobster gear removal restores coastal habitats in N.H.
Relevance: Derelict fishing gear and marine litter are continuing problems in coastal communities and on the Isles of Shoals, affecting marine wildlife, sea birds, commercial and recreational boaters, and beach goers. Accumulations of lobster traps and associated gear on N.H. beaches and on the Isles of Shoals throughout the year pose hazards for humans and can impact tourism and coastal aesthetics in the state.

Response: There are frequent coastal cleanups conducted on N.H. beaches, but because of state laws which prevent citizens from touching and removing lobster gear, lobster traps accumulate throughout the year. Removal of debris from the Isles of Shoals is even more challenging due to their location five miles offshore. Under the auspices of the Marine Debris to Energy Project, N.H. Sea Grant, the Blue Ocean Society for Marine Conservation, N.H. Fish and Game, and the N.H. Commercial Fishermen's Association have been able to continue yearly spring cleanups focusing specifically on removal of lobster gear from the entire N.H. coastline, and in 2012 expanded to the Isles of Shoals through the formation of partnerships with local fishermen and other island stakeholders. A website and project blog help keep the public informed.

Results: From 2010 to 2013, approximately 45 lobstermen and fishermen removed 189 tons of derelict lobster gear from N.H. beaches and six of the nine Isles of Shoals and partially restored over 700 acres each year. The gear was then turned into electricity at a neighboring waste-to-energy facility.
RECAP: The Marine Debris to Energy Project improved and restored coastal habitats in N.H. by removing derelict fishing gear and engaging large numbers of fishermen in the effort. Back to Goals

21805 - N.H. Sea Grant's Doyle Fellowships provide summer opportunities for undergrads with marine interests
Established in 2012 in memory of its former associate director to address the need for workforce development in marine science and policy areas, N.H. Sea Grant's Brian E. Doyle Undergraduate Marine Extension Fellowship program provides a summer-long internship for undergraduates that enables them to work alongside Sea Grant Extension and Education staff. During the summers of 2012 and 2013, six students representing three N.H. universities were Doyle Fellows. A Dartmouth College biology major worked on a range of aquaculture projects to culture rainbow trout, shellfish, oysters, scallops and mussels, while another Dartmouth biology and environmental science major worked with N.H. Sea Grant's coastal ecosystems specialist on a range of citizen science projects, including oyster restoration and eel monitoring. A visual arts student from UNH Manchester was instrumental in launching NHSG's video production component by advising Communications staffers on equipment purchases, training staff, and producing the program's first video. A UNH student interested in marine policy worked with city and regional planners, UNH climate change scientists and FEMA officials while working on NHSG's coastal communities and climate change initiatives. A UNH marine biology student traveled with fishermen and conducted interviews to introduce them to the public and spread awareness of current fishing practices and the future of the fishing industry, developing a blog on the subject, and another student worked with NHSG fisheries and aquaculture extension staff on

developing community supported fisheries (CSFs) in the N.H. Seacoast region and on marketing local seafood through the N.H. Fresh and Local campaign.

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21664 - Shellfish aquaculture contributes over $1M in ecosystem services to Great Bay Estuary

Relevance: Over the past few years, a great deal of attention has been focused on the impaired water quality of the Great Bay Estuary, particularly on the need to reduce nutrient inputs. One element of this has been a concern that aquaculture development in the area would exacerbate the problem.

Response: N.H. Sea Grant has been working for many years to help develop an aquaculture industry in the region, both to assure a supply of quality seafood and to help local commercial fishermen find ways to earn a living while remaining on the water. Various studies have shown that shellfish remove nutrients, including phosphorous, carbon and nitrogen, from their environment 24/7 through their filter feeding. Because of this, NHSG has been particularly interested in developing shellfish aquaculture in the estuary, both in the form of oyster farms and in multi-trophic aquaculture, which combines fish, seaweed and blue mussels.

Results: A NOAA Center for Coastal Monitoring and Assessment study validated NHSG's approach to the reduction of nutrient loading. The study placed a value of $1.1-1.3 million on the ecosystem services that the current level of shellfish aquaculture is providing the Great Bay Estuary and further estimated that the value could triple with future expansion.
RECAP: The shellfish aquaculture industry spawned over the years in the Great Bay Estuary with very direct N.H. Sea Grant guidance is providing fresh and local seafood to the region and helping area fishermen make a living while also contributing over $1 million in services to the estuarine environment.

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18774 - Vibrio research at UNH leads to formulation of control plans to protect human health and preserve shellfish businesses

RELEVANCE: An increasing number of New England shellfish beds are being temporarily closed down due to the presence of pathogenic Vibrios - bacteria that may be present in raw and undercooked shellfish and can lead to gastroenteritis in humans. Changing ecological and climatic conditions may influence the abundance and strain distribution of pathogenic Vibrios in New England shellfish such as oysters.

RESPONSE: With funding provided by NHSG, researchers identified components of climate change that alter microbial communities in oysters and potentially impact the abundance and distribution of pathogenic Vibrios.

RESULTS: Researchers presented this information to the public, shellfish growers and regulators at numerous venues in 2013. These information sessions assisted in the formulation of various Vibrio control plans aimed at protecting human health and preserving shellfish businesses in New England.
RECAP: N.H. Sea Grant-funded research helped inform Vibrio control plans that increase the awareness of the potential risks from eating raw or undercooked shellfish and the appropriate measures to reduce those risks and protect the New England shellfish industry.

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18699 - N.H. restaurants serve dogfish and educate customers based on feedback from consumer preference surveys

RELEVANCE: Commercial fishermen and those associated with the seafood industry are seeking ways to identify and create niche markets for local seafood in N.H. to sustain the few remaining groundfishermen in the state.

RESPONSE: In 2013, N.H. Sea Grant-funded researchers conducted consumer preference surveys at seafood tastings and other events to help promote awareness of local seafood, including underutilized species, and highlight the connection to the N.H. commercial fishing industry.

RESULTS: Due to the attention drawn to underutilized seafood species - dogfish, in particular - three restaurants in Portsmouth, N.H. now serve dogfish to their customers. Researchers also helped prepare educational material for restaurant staff to explain to them the importance of eating locally landed and sustainably caught seafood species, allowing restaurant staff to educate their customers about local seafood and potentially increase demand for underutilized species.
RECAP: N.H. Sea Grant-funded research and associated educational events and materials have helped spread awareness about local seafood and created a small but important market in restaurants that now serve dogfish and help support N.H. groundfishermen.

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18698 - Wholesaler incorporates N.H. Sea Grant research into business model for local seafood

RELEVANCE: N.H. Sea Grant-funded research indicates that consumers are interested in purchasing local seafood, as long as the product is fresh and is a familiar species. The researchers' surveys also showed that consumers want to connect to the fishermen who catch their seafood and want to know the premium they pay for local products goes to support those fishermen.

RESPONSE: Red's Best Seafood, a seafood wholesale company in Boston, Massachusetts, incorporated

these research findings into their business practices. They began placing additional emphasis on underutilized species and have implemented a real-time source tracking that places a premium on responsibly caught fish.

RESULTS: By incorporating NHSG research results into their business model, seafood wholesalers are connecting to new higher-value marketing channels and providing a fair price to fishermen for their catch.
RECAP: Based on research funded by N.H. Sea Grant, a seafood wholesale company now places more emphasis on underutilized seafood species and tracks their product to place a premium on responsibly caught fish. Back to Goals

18672 - American lobster research in N.H. leads to natural resources employment opportunity
N.H. Sea Grant-funded research focused on the calibration of new ventless lobster traps and standard trap surveys to optimize measurements of lobster abundance. The research supported a number of graduate and undergraduate students, including one Veteran. The experience this student gained from working on this project led to an employment opportunity conducting similar surveys beginning in 2013, with the environmental consulting group Normandeau Associates based in Portsmouth, N.H. This research has directly led to a well-trained professional entering the local workforce and thus contributing to the advancement of lobster and resource management in New England.
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18572 - Multi-species aquaculture industry continues to grow in N.H.'s Piscataqua River
RELEVANCE: The northeast fishing industry has suffered economically due to reduced landings and changing federal regulations, and fishermen are exploring strategies that can sustain their livelihoods and their heritage.

RESPONSE: N.H. Sea Grant and the University of New Hampshire have been investigating small-scale, multi-trophic (multi-species) aquaculture (IMTA) in the Piscataqua River for three years. This provides fishermen an opportunity to diversify and learn a new skill set. The model was adopted due to concerns by the EPA of nitrogen input from fish feed to the already nitrogen impaired river. By integrating the production of steelhead trout, blue mussels and sugar kelp, fishermen were able to grow and sell a new source of seafood while having a positive impact to the ecosystem.

RESULTS: The 2013 IMTA demonstration trial increased production levels from 2012. As important, the nitrogen extraction by the mussels and kelp exceeded the nitrogen input from trout, and thus had a positive ecosystem effect. In 2013, the fishermen harvested over 2400 lbs. of trout (sold for $6.25/lb.) and 1255 lbs. of kelp, collected over 12 million mussel seed, and put over four tons of mussels into cultivation. Sugar kelp is being marketed as a fresh product, not dried or processed, and the results have been promising. Estimates from Portsmouth restaurants are over $10/lb. New information gained from the project is being used to modify the current shellfish classification of the aquaculture site. The fishermen continue to build confidence in their culture methods with the guidance of N.H. Sea Grant, and further expansion is planned for 2014. In addition, IMTA has created new sources of sustainable, local seafood and employment, helping fishermen diversify into seafood production while continuing to fish.
RECAP: The integrated aquaculture of steelhead trout, mussels and sugar kelp has been accepted by the EPA and state regulatory agencies. Production levels increased in 2013, creating additional income for regional fishermen while increasing water quality. Back to Goals

18571 - N.H. oyster aquaculture industry generates jobs and reduces pollution
RELEVANCE: In N.H.'s Great Bay Estuary, nutrient influxes are generated from waste water treatment plants, runoff from impervious surfaces during spring melt and heavy precipitation. The bay nourished large numbers of the Eastern oyster (Crassostrea virginica) until the 1970s, when disease and siltation took out 90% of the population. Since 2010, shellfish aquaculture and restoration efforts have been growing steadily and the filter feeding oysters have made a comeback that has helped reduce the high nutrient levels in the bay.

RESPONSE: Permitting changes were adopted by the state in 2010 that have improved the ability of oyster farmers to gain access to state-owned bottom leases. With assistance from N.H. Sea Grant, numerous applicants have successfully sought shellfish aquaculture permits through N.H. Fish and Game and the industry has been expanding.

RESULTS: Two new oyster farms, the Pearl Oyster Company and Bay Point Oyster Company, were permitted in 2013, bringing the total farming community in Great Bay up to eight. In addition, Fat Dog Oyster Company expanded its operation by two acres. The total bottom area in production in upper and lower bay stands at 27 acres. Another two oyster farm sites are currently in the permitting process and hope to be in operation by the 2014 summer season. At present, over six million oysters are in culture with an estimated value of over $4 million. An oyster in N.H. waters takes three years to grow to a market size (3"). Fish and Game reported a total harvest of 81,274 oysters for 2013, which resulted in $61,780 in income for the aquaculturists. Currently, there are 26 people employed in oyster farming in the state.
RECAP: The N.H. oyster aquaculture industry continues to create jobs for coastal N.H., provide a fresh, locally raised product, and help clean up Great Bay. Back to Goals

18565 - Favorable winter flounder nursery habitats identified by N.H. Sea Grant researchers using fish growth and condition indices

Winter flounder populations on the eastern seaboard of the U.S. have reached historically low levels, despite increasing fishing regulations intended to preserve the species. Little is known about the quality of nursery habitats for winter flounder and how variations in quality affect recruitment into the adult populations. In 2013, N.H. Sea Grant-funded researchers calculated flounder growth and condition indices to indirectly evaluate the quality of twelve nursery areas ranging from New Jersey to New Hampshire. The data indicated that two sites - Boston Harbor, Mass., and Great Bay, N.H. - serve as the best nursery sites, while the Niantic River in Connecticut ranked as the worst nursery site. This research will help resource managers and scientists to better understand the effectiveness of indirect measurements like fish growth and condition to determine nursery quality for winter flounder recruitment.

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18562 - Lab analyses characterize arsenic species in New England seaweeds

Seaweeds are marketed directly for consumption as food and are also used in agriculture as feed supplements and fertilizers. Despite having high concentrations of some beneficial nutrients, marine macroalgae also hyper-accumulate arsenic, leading to concerns about arsenic exposure in humans. In 2013, N.H. Sea Grant-funded researchers conducted analyses to assess the total arsenic and arsenic species in commercially harvested and wild seaweeds from New England. Their results indicate that most of the arsenic present in seaweed is in the form of arsenosugars with the remainder present as dimethyl arsenic and trace amounts of the most toxic form, inorganic arsenic. This research will help scientists to understand the role that arsenic plays in possible human exposure from seaweed consumption and agricultural uses.

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18539 - Research indicates immediate need for seafood niche market development to help N.H. groundfishermen remain in business

The N.H. groundfishing fleet, facing a change in management policies, has declined from 37 individuals in 2009 to seven in 2013. With funding provided by a N.H. Sea Grant development grant, researchers sought to establish baseline socioeconomic indicators and social impact analysis for the groundfishing fleet. They conducted interviews with current and past operators of groundfishing vessels, asking them questions about management policies and their likelihood of remaining in the commercial fishing industry. Results of this study served as the basis for a UNH student's master's thesis in 2013 and indicated that there will likely be no groundfishing activity in the state within two years unless niche markets and distribution chains are identified or created. The feedback from these interviews will help encourage those involved in marketing local seafood to move quickly in identifying new markets to preserve N.H.'s groundfishing fleet.

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18531 - Survey indicates N.H. consumer interest in purchasing local seafood

Commercial fishermen are seeking ways to market their product locally to help increase their profits and reduce transportation and handling costs of the seafood, but little is known about consumer preferences for seafood in the N.H. Seacoast. With funding provided by N.H. Sea Grant, researchers conducted surveys to characterize seafood preferences by potential consumers within 150 miles of the N.H. Seacoast ports where fishermen unload their catch. In 2013, researchers completed their survey of 308 N.H. residents to gauge consumer preferences, demand and willingness to pay for local seafood. The results indicate that consumers are willing to pay a premium for local seafood and drive further to purchase the product if it is a species they are familiar with, if it is easy to cook at home or available at restaurants, and if the fishermen are receiving a fair price for the product. In addition, the survey also showed that consumers are most likely to purchase fresh fish fillets, followed by shellfish, seafood chowders and frozen fillets. These survey results will help fishermen and others who are marketing local seafood to better understand their target audience and to develop and improve markets for underutilized species.

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18514 - N.H. pathogenic Vibrio research leads to development of monitoring programs and detection methods in neighboring states

An increasing number of shellfish beds are being temporarily closed down due to the presence of pathogenic Vibrios - bacteria that may be present in raw and undercooked shellfish and can lead to gastroenteritis in humans. With funding provided by N.H. Sea Grant, researchers sampled oysters in N.H.'s Great Bay and conducted analyses to determine pathogenic Vibrio abundance and distribution in response to changing ecological conditions. In 2013, researchers helped Conn. and Mass. state shellfish programs to design V. parahaemolyticus monitoring programs and laboratory detection methods for subsequent years based on their NHSG-funded research. These efforts will help to create a more coordinated and widespread response to Vibrios, ensuring adequate steps are taken to protect human health and preserve the economic benefits of shellfish beds.

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18500 - Lobster bait deterioration reduces catch after one day in N.H. study

Previous research has shown that ventless lobster traps provide a more accurate estimate of natural lobster populations than standard traps. However, trap saturation may impact these catch values. In

2013, N.H. Sea Grant-funded researchers conducted studies to determine if ventless lobster traps saturate because they capture all the lobsters in the area fished by the trap, the bait in the trap loses its attractiveness, or once a certain number of lobsters are in the trap aggressive interactions lead to an increased rate of escape. Their findings indicate traps do not capture all the lobsters in the area. Rather, a combination of bait deterioration and increased escapes after 24 hours were primarily responsible for reduced catch after the first day the trap is on the bottom. These data indicate that ventless traps may be a useful tool for estimating the abundance of natural lobster populations, especially if steps are taken to adjust for the factors that lead to trap saturation.

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18285 - N.H. Sea Grant helps establish the Fisheries Extension Network Council

N.H. Sea Grant led the formation of the Fisheries Extension Network Council (FENC) in 2013 and currently chairs the Council, which seeks to foster efficient communication and collaboration among Sea Grant fisheries extension specialists, program leaders and the National Sea Grant Office. Efficient and productive networking will enhance existing programming, support new initiatives, and improve the capacity of Sea Grant to respond effectively to challenges facing sustainable and responsible resource stewardship by our nation's wild fisheries and aquaculture industries. Ultimately, this initiative will provide critical outcomes for both fishing communities and Sea Grant in an increasingly competitive funding environment with many disparate and often competing entities. The Council aims to support activities that will help realize the full potential of the Sea Grant Network while raising Sea Grant's value in fishing communities, nationally and within NOAA. The FEN views "fisheries" as including all users - commercial fishermen, for-hire charter/head boat operators, recreational anglers, and those involved in mariculture ventures. In addition to the FENC chair, the Council includes nine regional council members, a National Sea Grant representative, and liaisons with the Sea Grant Extension Assembly and program directors. Monthly meetings, a webinar series, updating and maintaining the FENC list-serve, and fostering collaboration, communication and program development will be key activities of the FENC.

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18280 - N.H. Fresh and Local Seafood direct marketing campaign links fishermen with consumers

RELEVANCE: The New Hampshire fishing industry has experienced some serious hardships due to cuts in the groundfish fishery and the recent glut of lobsters flooding the market. These financial hardships have led to a reduction of the fishing fleet and threaten the existence of N.H. fisheries.

RESPONSE: N.H. Sea Grant intensified its seafood direct marketing efforts through the launch of the N.H. Fresh and Local Seafood direct marketing campaign for the 2013 fishing year. The campaign sought to bring awareness to seafood consumers and increased revenue to local fishermen. Under the umbrella of the campaign, NHSG worked with local restaurants, breweries, fishermen and farmers markets to educate consumers on the availability of locally harvested seafood and local underutilized species. Through seafood dinners and a presence at local events and farmers markets, as well as through social media and video, NHSG was able to build up momentum and enthusiasm and reached nearly 5,000 N.H. consumers. The 2013 effort also added two lobstermen, two restaurants, one oyster farmer and one community supported fishery to the N.H. Fresh and Local Seafood initiative.

RESULTS: Campaign efforts resulted in the formation of new relationships between fishermen, chefs, dealers and others in the industry, which led to increased revenues through alternative markets. In addition, social media traffic increased and participation in NHSG-sponsored events doubled, indicating a growing consumer interest and awareness in sourcing locally harvested seafood.
RECAP: The 2013 N.H. Fresh and Local Seafood direct marketing campaign increased awareness of and demand for local seafood, and it opened up alternative revenue streams for local fishermen.

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17041 - N.H. Sea Grant-funded Efforts Lead to Mass-production of Winter Flounder for Stock Enhancement

Fishermen and resource managers are seeking ways to improve winter flounder populations in waters off of Martha's Vineyard, Mass. Stock enhancement may be a viable method to reach that goal, but local fishermen and resource managers needed additional expertise to begin those efforts. After renovations of an old shellfish hatchery on the island were complete, N.H. Sea Grant-funded researchers trained project volunteers in 2012 to take the lead on aquaculture tasks including fish spawning, broodstock management, larviculture and live feeds culture. Based on this training, project volunteers produced and raised 4,310 hatchery-reared juvenile flounder for eventual stocking in an estuary on the island. These efforts demonstrated the ability to start a stock enhancement project in a community with little or no aquaculture expertise and successfully mass-produce winter flounder in a hatchery setting.

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16883 - Newly Developed Seaweed Aquaculture Methodologies Incorporated into Vocational School Training

RELEVANCE: Seaweeds are capable of extracting fish waste products from the environment and can be incorporated into integrated multi-trophic aquaculture (IMTA) systems. However, the absence of a commercial source of young cold-water marine seaweeds to grow in IMTA systems provided a substantial barrier.

RESPONSE: In 2012, researchers funded by N.H. and Connecticut Sea Grant developed the methodology necessary to seed longlines with spores from the seaweed Gracilaria that are expandable to a commercial scale.

RESULTS: The Bridgeport Regional Vocational Aquaculture School is using this methodology to grow Gracilaria on longlines at its lease site in Long Island Sound and has incorporated the nursery technology into its training programs for students.
RECAP: Researchers funded by N.H. and Conn. Sea Grant developed the methodology to grow Gracilaria on longlines, which is now being used at an aquaculture school to train students for future jobs in aquaculture.

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16880 - Model Created by N.H. Sea Grant Researchers Predicts Greater Numbers of Non-native Tunicates in Gulf of Maine Waters

There is increasing interest in expanding aquaculture efforts for shellfish and seaweed species in the Gulf of Maine coastal waters. However, invasive tunicates often grow on aquaculture infrastructure and cultured species, causing crop loss and increased maintenance and processing costs. Populations of many non-native tunicates in the Gulf of Maine appear to be increasing, a trend that may be caused in part by warming ocean waters. In 2012, using N.H. Sea Grant development funds, researchers created a model of the predicted effects of warmer seawater temperatures on the populations of two non-native colonial tunicates in the Gulf of Maine - Botrylloides violaceus and B. schlosseri. The model results indicate that warming waters will result in greater numbers of both of these species, particularly in northern Gulf of Maine coastal waters. These findings will allow aquaculturists and resource managers to predict the spread of these tunicates for potential mitigation of their economic and ecological impacts.

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16866 - N.H. Sea Grant Researchers Calculate First Estimate of Spring-spawning Cod Biomass in Ipswich Bay

Atlantic cod populations experienced a collapse in the mid-1990s in the Gulf of Maine. Since that time resource managers and researchers have focused on finding improved methods of protecting cod populations and restoring them to sustainable levels. Using Sea Grant funds, researchers conducted surveys using multi-beam sonar to provide better estimates of cod population abundance and distribution than single- or split-beam echosounders and trawls. Based on their studies, researchers have calculated the first estimate of spring-spawning cod biomass in Ipswich Bay, Mass. This estimate provides more accurate information to help resource managers make better decisions about protecting the cod fishery and ensuring its future sustainability.

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16859 - N.H. Sea Grant Research Indicates Fish Retailers, Restaurants Willing to Sell Underutilized Seafood Species

In an effort to identify alternative marketing opportunities for seafood in New Hampshire, N.H. Sea Grant-funded researchers conducted surveys to determine what factors retailers, restaurants, fish mongers and other alternative venues consider when purchasing seafood. Based on interviews and a survey of around 90 restaurant and retail store managers in 2012, 40% said that local seafood is a more important factor than the price for their customers. Around 80% of business owners sell shellfish while 65% sell finfish, but most said they would purchase filleted fish if it were more readily available. Many business owners said they would be willing to purchase local underutilized seafood species including monkfish, redfish and dogfish to sell to customers if there was a demand for it, and if a filleted product was available. Their findings indicate there is an unmet demand for local fish, an interest in offering more of it and a need for a processor and delivery system in the state. These survey results will help identify best practices for tapping into local and regional alternative markets in an effort to keep the local fishing industry economically sustainable.

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16858 - Surveys Characterize Consumer Seafood Preferences in New Hampshire's Seacoast

Recent federal regulations have contributed to a reduction in N.H.'s total groundfish catch and its fishing fleet. Fishermen are seeking alternatives to increase their profits by reducing costs of handling, transportation, processing and distribution of fish by out-of-state distribution agents. N.H. Sea Grant-funded researchers examined data from consumer surveys to characterize seafood preferences by potential consumers within a half-day-goods-distance (150 miles) of N.H. ports where fishermen unload their catch. Based on their survey analyses in 2012, researchers determined that women of childbearing age who cook at home and have household incomes above $80,000 are the most likely consumers of seafood. These consumers tend to purchase wild fresh fish, they live close to the N.H. Seacoast and are willing to travel 10-20 miles to the point of sale. These data will help inform efforts to tap into local alternative markets, thereby helping the commercial fishing industry better position itself to deal with further regulatory changes and make it less susceptible to competition by low-cost imports.

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16730 - N.H. Sea Grant Researchers Develop Protocols for Alewife Culture that Lead to Direct Economic Benefits

RELEVANCE: Smelt, alewives and blueback herring comprise the most dominant anadromous species in the Great Bay Estuary and support limited fisheries. However, recent coastwide declines in their

populations are causing concern. Producing alewives via aquaculture could aid in both stock enhancement and marine baitfish supply, taking some pressure off the wild populations to ensure their sustainability.

RESPONSE: NHSG-funded researchers developed protocols in 2012 for alewife broodstock spawning, larviculture and juvenile rearing, including the establishment of salinity tolerances for larval and juvenile alewives. Researchers demonstrated the ability to successfully mass-produce thousands of young alewives in an aquaculture setting.

RESULTS: Harmon Brook Farm in Caanan, Maine, is using these protocols to culture alewives for marine baitfish purposes. This company has benefited financially from the production and sale of alewives based on these protocols and they plan to increase production in the coming years.
RECAP: N.H. Sea Grant-funded researchers developed alewife aquaculture protocols that are being used in a marine baitfish supply business, providing direct economic benefits. Back to Goals

16722 - N.H. Sea Grant Helps Fishermen Sustain the Industry with Innovative Gear
RELEVANCE: Fisheries management sets aggressive conservation goals based on mandated elements of the Magnuson-Stevens Act. In addition, sector management provides strict incentives for fishermen to target abundant species while avoiding weaker stocks. The development of new fishing gear and practices are critical in this setting to sustain the industry.

RESPONSE For many years, N.H. Sea Grant has engaged in collaborative research projects and outreach efforts that explore opportunities for fishermen to fish more selectively through innovative gear modifications.

RESULTS: N.H. Sea Grant led a collaborative research and outreach project designed to reduce the catch of Atlantic cod while increasing or not influencing the catch rate of other target species, such as Pollock. A follow-up effort in 2012 further tested a raised gillnet that appears to achieve this aim. Use of the nets will be expanded in 2013 and should allow N.H. fishermen to catch more of their allowable quota by being more selective with their fishing effort. Presentation of this work at several workshops and informally to fishermen resulted in extending this project to gillnet fishermen from Port Clyde, Maine.
RECAP: N.H. Sea Grant continues to partner with fishermen and other regional scientists to test a gillnet design that avoids Atlantic cod, a species with limited Total Allowable Catch, while continuing to catch other economically valuable species, such as Pollock. Back to Goals

16721 - N.H. Sea Grant Leads National Community Supported Fisheries Summit
In late spring 2012, N.H. Sea Grant partnered with Maine Sea Grant to fund, organize and host a National Community Supported Fisheries (CSF) Summit. This event brought together 70 extension workers and fishermen and organizers involved with CSFs. Overall, 21 CSFs were represented from nine states and two Canadian provinces. In addition, 40 extension specialists participated in a follow-up webinar that summarized results and impacts. The final report from the meeting has been used to identify needs for fishing communities engaging in alternative marketing strategies. The Summit led directly to changes in CSF management among many participants and has led to increased networking and exchange of expertise that has improved CSF efficiency nationally.

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15503 - N.H. Sea Grant Research on Forage Fish Records Helps Guide Gulf of Maine Population Models
RELEVANCE: Populations of forage fish - specifically, alewives and shad - in rivers near the Gulf of Maine have declined dramatically in the last century. However, very little is known about their status prior to the declines, how human activities affected their populations, and how declining populations affected the Gulf of Maine.

RESPONSE: Researchers supported by N.H. Sea Grant have made significant progress in digitizing and extracting data about alewife and shad populations as well as predator species from fish inspector reports and fish commission reports in Maine and Massachusetts variously ranging from 1804-1960.

RESULTS: These data are being incorporated into analytical models to determine the ecological and economic role of forage species in the Gulf of Maine and helped fisheries managers to develop a new method of estimating species abundance and distribution. The Boston-based non-profit group SeaPlan is beginning to incorporate the long time-series and spatial distribution patterns of alewives generated by this project into MIMES/MIDAS scenario-building models of nearshore ecosystems and coastal economies in the Gulf of Maine. In addition, the University of Maine's Diadromous Species Restoration Research Network has used these data to explore new analytical techniques, such as variability analysis, to estimate changes in abundance of Maine alewives and other diadromous species over time.
RECAP: N.H. Sea Grant-funded researchers digitized and extracted data about alewife and shad populations from the 19th- and 20th centuries, allowing fishery managers to incorporate the data into their population model estimates and establish better historical baselines for the Gulf of Maine forage species and their predators. Back to Goals

15470 - Multi-trophic Aquaculture Raises Profits while Reducing Pollution
RELEVANCE: As fish aquaculture production increases in New England, there is concern over its

environmental impact due to the production of organic and inorganic metabolic waste. Seaweed and filter-feeding shellfish are capable of extracting these waste products from the environment and can be incorporated into multi-trophic aquaculture systems and later harvested for human consumption. However, the absence of a commercial source of young seaweed plants to grow in these systems provided a substantial barrier.

RESPONSE: Researchers funded by N.H. and Connecticut Sea Grant developed the technology necessary to establish commercial-scale seaweed nurseries for incorporation into fish and/or shellfish aquaculture operations to remove excess nutrients from the water while providing consumers with locally grown sea vegetables.

RESULTS: Ocean Approved LLC (Portland, Maine) is using this technology to seed kelp longlines integrated into their mussel production sites and has sold their kelp product to local retail outlets including Whole Foods. Matunuck Oyster Farm (South Kingston, R.I.) is using it to integrate "Gracilaria" cultivation into their oyster beds. Both companies have benefited economically from the production and sale of these sea vegetables.
RECAP: N.H. and Conn. Sea Grant-funded researchers developed the technology to establish seaweed nurseries, thus allowing businesses to effectively utilize multi-trophic aquaculture systems for direct ecological and economic benefits. Back to Goals

15453 - NHSG Guides Development and Coordination of Regional Lobster Trade Adjustment and Assistance Program
In New Hampshire, 154 lobstermen participated in the Lobster Trade Adjustment and Assistance Program, a USDA training and financial assistance effort designed to help fishermen who have experienced revenue decreases due to foreign imports. In 2011, workshops were held in N.H. both in-person and online for participants in this program. The in-person workshops held in Portsmouth, N.H., were also attended by lobstermen from southern Maine and northern Massachusetts. N.H. Sea Grant developed two workshops and helped facilitate the sign-up, initial orientation and intensive workshop portions of this program and generally provided support for lobstermen as they progressed through the program.

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15451 - Green-Fit Program Seeks to Increase Efficiency of Fishing Boats
During the summer of 2011, N.H. Sea Grant helped refit two vessels with oil-filter bypass systems, real-time fuel monitoring systems, and hydrogen assist fuel injection systems as part of the Green-Fit Program, a national effort to improve the efficiency of fishing boats. One of the vessels was also refitted with a passive wind generator and a LED deck lighting system. Cost-benefit analysis indicated that the hydrogen fuel injection systems provided no measurable increase in the energy efficiency of the fishing operations. However, the LED deck lighting system paid for itself in less than two years and provides an estimated savings of $30,000 over 11 years. The passive wind generation system would take 15 years to pay for itself, but provides the indirect benefits of a high-visibility green strategy that reduces the carbon footprint of a fishing operation. Continued testing of installed and other systems will occur throughout 2012.

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14021 - 30% of Northeast Shrimpers Using Conservation Technology
The amount of bycatch in the shrimping business has always been a point of concern. Finfish and groundfish accidentally caught in the nets sometimes outweigh the shrimp. The Nordmore grid, which became mandatory in 1992, was somewhat successful in lowering bycatch but still allowed small fish to be captured. N.H. commercial fishermen worked closely with NHSG staff to design a new topless trawl based on the difference in swimming behaviors between fish and shrimp. By removing the top portion of a shrimp trawl, the new nets allow fish to swim over the headline to escape while capturing the shrimp that roll along the bottom of the net. The topless trawl significantly reduces bycatch, which decreases the sorting time needed on boats and can thus improve the shrimp quality. During the 2010 northern shrimp season, there were 121 vessels from Maine, 5 from Massachusetts, and 14 from New Hampshire, for a total of 140 using shrimp trawls. Of those vessels, approximately 30% use conservation technology developed and transferred to the industry by N.H. Sea Grant.

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14010 - Multi-beam Sonar Enhances N.H. Sea Grant Studies of Cod Abundance
RELEVANCE: Atlantic cod populations experienced a collapse in the mid-1990s in the Gulf of Maine. Since that time, management measures and research have focused on finding improved methods of protecting and restoring cod populations back to sustainable levels.

RESPONSE: Using N.H. Sea Grant funds, researchers conducted cage experiments and open water surveys using multi-beam sonar to identify the acoustic signature of cod and provide better estimates of cod population abundance and distribution than single- or split-beam echosounders and trawls.

RESULTS: Based in part on this research, the National Marine Fisheries Service established a cod spawning closure, prohibiting all fishing during the spawning season in the Whaleback area of the Western Gulf of Maine.
RECAP: Multi-beam sonar research has helped establish management measures aimed at protecting and restoring cod populations in the Gulf of Maine. Back to Goals

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Program Performance Measures (2010 - 2013)

Program Performance Measure	Program Plan Target (2010-2013)	Reported	Program Comments
Number of participating producers, retailers and wholesalers of the NH Fresh and Local Brand.	30	131	2012 - We have re-engaged with previous NH Fresh and Local Brand partners, added significant numbers to the list and will continue to re-launch the NH Fresh and Local Brand in 2013. 2013 - We added a Community Supported Fishery as a new participant of the N.H. Fresh and Local brand.
Number of aquaculture producers using low environmental impact techniques or technologies.	6	47	2012 - All 10 N.H. permitted aquaculture sites utilize shellfish that sustain themselves by filter feeding nutrients and particulate matter from the water. They provide ecosystem services for the environment. 2013 - Oyster farmers = 15 integrated multi-trophic aquaculture = 7
Number of consumers that participate in sustainable seafood programs, community supported fisheries, farm-to-market-venues and choose local or regional seafood over imports.	2,000	13,310	2012 - This is difficult to tally, but local restaurants are serving more local seafood, lobster ravioli was broadly distributed (from N.H. lobstermen), and a new CSF provided close to 1000 deliveries in 2012. 2013 - (1000) Community Supported Fishery participants (N.H. Community Seafood shareholders and consumers at Winter Farmers Market), (275) N.H. Fresh and Local Seafood Kickoff, (35) Dogfish Dinner - Green Monkey, Portsmouth, N.H., (1000) Vintage and Vine Festival, Portsmouth, N.H., (2500) Winter Farmers Markets and Summer Farmers Market outreach efforts. We put more effort this year into marketing local seafood based on an identified need by industry.
Number of fishermen and distributors participating in the 'NH Local Seafood' brand.	30	136	2012 - 30 restaurant and distributor partnerships with N.H. Fresh and Local Seafood brand were renewed and the NHseafood.com website was re-launched with new content and updated community links. 2013 - We added additional partnerships this year: 2 lobstermen, 2 restaurants, 1 oyster farmer and 1 Community Supported Fishery.
Number of fishermen and fishery stakeholders trained in responsible aquaculture techniques.	20	79	2012 - A total of 23 fishermen were trained through local workshops and after hour meetings (when fishers are not fishing). 2013 - Fishermen = 10 shellfish farmers = 18
Number of fishermen trained in seafood safety and safe handling guidelines.	50	218	2012 - N.H. Sea Grant co-coordinated 2 fishing industry workshops with the Gulf of Maine Research Institute. One portion of the curriculum included seafood safety and safe handling education. In 2013, this work will be de-emphasized due to changes in staff. In 2013, we will explore ways to continue to find ways through community and regional connections and/or developing staff capacity to meet this need in our fishing community. 2013 - 2 HACCP plans in a company in York, ME. We no longer have the capacity to provide training in HACCP in our staff, which is why our numbers are lower in this area than previously anticipated.
Number of fishermen who adopt conservation	20	117	2012 - 13 commercial fishermen adopted the non-parallel bar shrimp grid 4 commercial fishermen used the topless shrimp trawl

minded fishing technology.			3 fishermen adopted the dog grate to eliminate dogfish bycatch in the small mesh fishery. 2013 - 3 fishermen in N.H. used alternative gillnets to explore the use of a raised gillnet to avoid cod. 2 fishermen used alternative groundcables to explore ways of reducing sea-bed impact. 60+ fishermen adopted LED pinger technology designed to improve the ability for fishermen to monitor functionality of acoustic pinger systems that reduce harbor porpoise interactions with gillnet fishing. The LED pinger program was funded, in part, through the GEARNET project and was developed and supported by SG personnel and co-PI on the project.
Number of fishermen who adopt open ocean mussel aquaculture businesses.	2	10	2012 - 8 fishermen were trained on mussel culture techniques nearshore. Four of these are now looking at securing 2 offshore lease sites in N.H. 2013 - Four new farmers starting up in N.H.
Number of fishermen who utilize techniques and technologies that improve operational efficiency and/or reduce fuel consumption.	6	22	2012 - 3 fishermen began using fuel flow-meters and 1 fisherman adopted passive wind generation 3 fishermen adopted LED deck-lighting systems 2013 - 2 N.H. fishermen using fuel flow meters that generally save fishermen fuel. Regionally, 8 others adopted fuel flow meters and used either semi-pelagic door systems or fine-mesh net material designed to improve fuel efficiency that is part of the GEARNET project and was developed and supported by SG personnel and co-PI on the project.
Number of HACCP programs devoloped or faciliatated by NH Sea Grant	3	14	2012 - 2 Histamine Producing Fish HACCP plans were developed 1 Fish Smoking HACCP plan was developed, and 1 Lobster Processing HACCP plan was developed for N.H. fresh fish businesses. 2013 - (1) lobster processing and (1) fish processing for Skipper's Bay, York, ME. We have experienced a shift in our personnel and no longer have the capacity or expertise to deliver HACCP training as frequently as in the past. We are considering ways to compensate for this loss since HACCP and seafood safety and handling remain a need in our seafood industry.
Number of new aquaculture producers of finfish and shellfish in NH.	6	36	2012 - 3 new oyster permits were granted and one multi-trophic aquaculture farm operated by UNH and the Portsmouth Commercial Fishermen's Association 2013 - New oyster farm producers = 4 integrated multi-trophic aquaculture = 7
Number of regional symposia and/or conferences sponsored and/or delivered.	6	41	2012 - Examples include: National Summit on Community Supported Fisheries (May 31) Webinar - Report of National Summit on Community Supported Fisheries (June 13) Direct Marketing Emerging Themes Session (Sea Grant Week) Outreach Planning Meeting for GEARNET project Community Supported Fisheries: Challenges and Opportunities talk given at Aquaculture and Restoration Meeting, Newport, R.I. GEARNET Flume Tank Workshop for Fishermen, Halifax, Nova Scotia 2013 - (2) Northeast Groundfish Fisheries Reporting Working Group Meetings, (1) Lobster Trade Adjustment and Assistance Fuel Efficiency Workshop in Rockland, ME, (2) REDNET Progress and Planning meetings to discuss program to develop a redfish fishery in the Northeast, (2) Great Bay Oyster Farmer Workshops, and other regional workshops from R.I. to Maine.
Number of seafood consumer education	6	28	2012 - UNH Sustainability Dinner (April 11) - educational materials presented to raise awareness regarding N.H. fishing industry

workshops.			Presentation at Opening Delivery of Kittery Point CSF Fish and Lobster Festival - educational materials presented to educate seafood consumers and N.H. fishing industry 2013 - (5) Farmers Market outreach events, (1) Science CafÃ© discussion of seafood sustainability and local fishing industry, (5) local seafood dinner sponsors, (1) Local Foods Workshop with Agriculture Sector in Haverhill, N.H., (1) Local Fish and Fishing talk to Marine Docents, (1) Local Fish and Fishing talk to Portsmouth tourists on an evening Gundalow cruise in Portsmouth Harbor, (1) Blue Ocean Society - Naturalist Workshop on local vs sustainable seafood.
Number of seafood producers using quality control and safety guidelines as the result of NH Sea Grant programs.	20	87	2012 - These numbers reflect efforts to develop seafood HACCP plans with fishermen and dealers in N.H. Due to changes in personnel, we will look for new ways to address this need in 2013 through partnerships or professional development of existing staff. 2013 - We assume that our restaurant, retail and fishermen partners continue to use quality control and safety guidelines as a result of N.H. Sea Grant programs.
Number of workshops on operational and production efficiency in the commercial fisheries.	6	17	2012 - 2 workshops offered as part of the Trawl-to-Table education program which was co-coordinated with the Gulf of Maine Research Institute 1 workshop given at Innovations in Fisheries meeting hosted by Gulf of Maine Research Institute 2013 - (1) Lobster TAA program fuel efficiency workshop, (2) HACCP consultation workshops, (2) REDNET workshops to share results of research to explore developing a redfish fishery in the Northeast, (1) presentation to Yankee Fishermen's Cooperative on the success of their program to sell through Red's Best - an operation that sells fish 'traceable' to the fisherman.
Number of workshops on sustainable aquaculture technology.	6	41	2012 - 4 aquaculture training workshops were conducted with N.H. fishermen Mussel Technology Development workshop in Portland, Maine, with mussel farmers Aquaculture Messaging for Public Aquaria session held with NOAA, USDA and Mystic Aquarium at the World Aquaculture Society (WAS) Conference, Nashville, Tenn. eXtension Marine Aquaculture CoP launch also at WAS NE Aquaculture Extension meeting in Providence, R.I. NACE Marine Aquaculture 101 workshop in Groton, Conn. 2013 - Local workshops with aquaculture farmers - fishermen and shellfish producers.
Number of workshops on topics related to sustainable fisheries, management and fishing practices.	15	76	2012 - Examples include: NHseafood.com Re-launch Design Workshop (March 14) Understanding the Cod Crisis Fisheries Roundtable (April 19) Fisheries and Spatial Planning Fisheries Roundtable (May 16) National Summit on Community Supported Fisheries (May 31) Webinar - Report of National Summit on Community Supported Fisheries (June 13) Lobster Price Crash, Lobstermen and Dealer Discussion Flume Tank Workshop for Fishermen, Halifax, Nova Scotia UNH Sustainable Food Systems Task Force Panel Fisheries in Local Food Systems talk at N.H. Farm Bureau banquet Community Supported Fisheries in N.H. planning workshop Outreach planning meeting for GEARNET project Conservation gear brainstorming session - N.H. Groundfish Sector Meeting

			2013 - (2) Lobster Roundtable Discussions with lobstermen and dealers, (5) local and sustainable seafood marketing campaign discussion and workshops, (2) Northeast Groundfish Dealer Reporting Working Group meetings, (1) Lobster TAA Fuel Efficiency Workshop, (1) Local Foods Workshop with Agriculture Sector in Haverhill, N.H., (1) Local Fish and Fishing talk to Marine Docents, (1) Science CafÃ© discussion of sustainable fishing in Manchester, N.H., (2) REDNET workshops to develop a sustainable redfish fishery, (5) GEARNET meetings to discuss and implement projects designed to improve fishing efficiency and selectivity in groundfish fishery.

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Program Objectives (2010 - 2013)

Program Objective	Achieved (yes/no)	Program Comments
By 2013, fishery managers in the states of Maine and New Hampshire will employ New Hampshire Sea Grant supported research findings into management models for the Gulf of Maine lobster fishery.	Yes	2012 - State of Massachusetts lobster biologists are currently using drifters developed/modified by NHSG researchers to study the dynamics of larval drift. The Atlantic Offshore Lobster Association has used these findings to modify harvest practices. They have also engaged in discussions about their findings with representatives from all the state agencies responsible for managing the lobster fishery. 2013 - A State of Massachusetts Division of Marine Fisheries employee trained on a NHSG project is now in charge of ventless lobster trap surveys in Massachusetts.
A 300% increase in NH aquaculture production and number of producers is observed.	Yes	2012 - Increases are based on new oyster leases (3), oyster seed set out (> 2 million), trout production (up 1250 lbs from 250 lbs) and the collection and growout of over 10 million mussel seed. 2013 - Increases are based on new oyster leases (5), oyster seed set out (> 3 million), trout production (up 2400 lbs from 1250 lbs) and the collection and growout of over 12 million mussel seed.
A measured increase in the percentage of seafood harvested in NH and the Northeast supplies local and regional markets.	Yes	2012 - We are not currently tracking this objective effectively and will develop a repeatable and effective methodology in 2013. 2013 - Although we are still developing effective tracking of this objective's measureable impacts, we are confident this number is increasing based on increased activity within community supported fisheries, new retail outlets for local seafood and the increase in restaurant partnerships with the N.H. Fresh and Local Seafood brand.
At least 1 workshop per year is offered on; nutritional benefits of seafood, quality and handling guidelines and local seafood production.	Yes	2012 - Two sessions in Trawl-to-Table event were given highlighting the importance of quality and handling for fishermen to meet standards in the restaurant business. 2013 - HACCP training provided to one business in York, Maine.
By 2010, 3 new 'NH Local Seafood' markets will be developed that will serve over 500 customers.	Yes	2012 - Off the boat sales, lobster ravioli, and a Community Supported Fishery, restaurants featuring locally sourced dogfish, and a new retail operation at the Yankee Fishermen's Cooperative were developed and reached at least 3,000 customers. 2013 - Off the boat sales, lobster ravioli, and a new Community Supported Fishery (N.H. Community Seafood) was founded with the help of N.H. Sea Grant, restaurants featuring locally sourced dogfish, and a new retail operation at the Yankee Fishermen's Cooperative were developed and reached at least 3,000 customers.
By 2011, at least 10 new	Yes	2012 - 16 aquaculture permits were submitted and 9

aquaculture lease permits will be submitted to NH Fish & Game for consideration.		were approved. 2013 - 16 aquaculture permits were submitted and 11 were approved.
By 2011, New Hampshire Sea Grant funded research will train at least 12 individuals and up to 8 undergraduate students in aquaculture and responsible stock enhancement practices.	Yes	2012 - There have been 17 undergraduate students trained through this project, and there were 18 people trained at a 2010 workshop. Others have also been trained, including 3 graduate students and several commercial fishermen who helped with the initial stock enhancement release in 2012. 2013 - There have been 17 undergraduate students trained through this project, and there were 18 people trained at a 2010 workshop. Others have also been trained, including 3 graduate students and several commercial fishermen who helped with the initial stock enhancement release in 2012.
By 2012, at least 30 NH restaraunts will affiliate with the 'NH Local Seafood' brand.	Yes	2012 - The NH Fresh and Local Brand was re-launched through a revised NHSeafood.com website. Partnerships with restaurants were re-established and additional partnerships added. 2013 - In 2013, the N.H. Fresh and Local brand partners were maintained through the NHSeafood.com website. A Twitter account and Facebook page were also launched in 2013. Partnerships with restaurants were re-established and additional partnerships added. We initiated a N.H. Fresh and Local Seafood marketing campaign this year that further expanded the network of engaged consumers and partners providing seafood.
By 2012, New Hampshire Sea Grant funded research will produce 100,000 hatchery reared juvenile winter flounder for stock enhancement in NY and MA coastal areas.	Yes	2012 - Anticipated adequate space for this at UNH was not available, so an inactive shellfish hatchery in Martha's Vineyard was renovated and used by newly trained locals in 2012. Due to a variety of unforeseen circumstances, there were 4,310 juveniles reared and released in 2012. 2013 - Anticipated adequate space for this at UNH was not available, so an inactive shellfish hatchery in Martha's Vineyard was renovated and used by newly trained locals in 2012. Due to a variety of unforeseen circumstances, there were 4,310 juveniles reared and released in 2012.
By 2012, New Hampshire Sea Grant fundied research will lead to the development of an economically-viable Nori aquaculture model.	Yes	2012 - An aquaculture model for 2 local nori species has been developed, including the successful nursery cultivation of seedlings, and use by Great Bay Aquaculture as a tank biofilter to remove nutrients and produce high value fish feed. Ongoing developments include expansion of the model to include 1 more species and off-shore cultivation on long lines based on another NHSG-funded aquaculture model for kelp. 2013 - An aquaculture model for 2 local nori species has been developed, including the successful nursery cultivation of seedlings, and use by Great Bay Aquaculture as a tank biofilter to remove nutrients and produce high value fish feed. Ongoing developments include expansion of the model to include 1 more species and off-shore cultivation on long lines based on another NHSG-funded aquaculture model for kelp.
By 2012, New Hampshire Sea Grant will "green-fit" an operational commercial fishing vessel as a demonstration platform of technologies that improve operational and fuel efficiency.	Yes	2012 - This project was completed and a report will be placed online at the Sustainable Marine Fisheries CoP site in 2013. 2013 - This project was completed and a report will be placed online at the Sustainable Marine Fisheries CoP site in 2013.
By 2013, at least 1 business using the integrated multi-tropic aquaculture model for Nori production will be created.	Yes	2011 - Two businesses have been created 2012 - Two businesses have been created. 2013 - Two businesses have been created.

By 2013, at least 5 commercial fishing vessels will use technology and/or strategies that increase operational and fuel efficiencies.	Yes	2012 - 5 vessels installed fuel meters, 2 installed LED deck lighting systems that reduce environmental impacts. At least 2 fishermen did not purchase hydrogen fuel assist systems based on results from this study - this saved fishermen money due to the ineffectiveness of this technology in saving fuel costs. We will continue to track the impacts of the Green-Fit project, and will merge our results with other results at the Sustainable Marine Fisheries CoP. 2013 - 5 vessels installed fuel meters, 2 installed LED deck lighting systems that reduce environmental impacts. At least 2 fishermen did not purchase hydrogen fuel assist systems based on results from this study - this saved fishermen money due to the ineffectiveness of this technology in saving fuel costs. We will continue to track the impacts of the Green-Fit project, and will merge our results with other results at the Sustainable Marine Fisheries CoP.
By 2013, at least 5 new aquaculture businesses will be created in NH.	Yes	2012 - 9 permits were approved and another 6 are pending. 2013 - 11 permits were approved and another 4 are pending.
By 2013, fishermen will choose direct marketing approaches that increase access to locally harvested seafood serving more than 2000 customers.	Yes	2012 - Off the boat sales, lobster ravioli, and a Community Supported Fishery and new retail operation at the Yankee Fishermen's Cooperative were developed and reached an estimated 3,000 customers. 2013 - Off the boat sales (FV Rimrack), lobster ravioli (Portsmouth Lobster Company), and a Community Supported Fishery (N.H. Community Seafood) and new retail operation at the Yankee Fishermen's Cooperative were developed and reached an estimated 3,000 customers.
By 2013, new data on historic anadromous fish population numbers will be incorporated into NMFS models for anadromous fish management models for the Gulf of Maine.	Yes	2011 - SeaPlan, DSRRN 2012 - SeaPlan, Diadromous Species Restoration Research Network (DSRRN) 2013 - SeaPlan, Diadromous Species Restoration Research Network (DSRRN)
Delivery of boat-based programs to at least 400 citizens per year.	Yes	2012 - In 2012, Discovery Cruises to Isles of Shoals (300 adults and 60 children), Discovery Cruises on Great Bay (55 adults and children) and Floating Labs (150 students). 2013 - In 2013, Discovery Cruises to Isles of Shoals (275 adults and 50 children), Discovery Cruises on Great Bay (65 adults and children) and Floating Labs (630 students).
Delivery of in-school programs to at least 2500 K-12 students and teachers per year.	Yes	2012 - UNH Marine Docents delivered SeaTrek programs to 7345 students and teachers during the 2012 reporting period. 2013 - UNH Marine Docents delivered SeaTrek programs to 7300 students and teachers during the 2013 reporting period.
From 2011 - 2013, at least 20 commercial fishermen will be trained in finfish or shellfish aquaculture techniques.	Yes	2012 - 23 fishermen were trained on aquaculture via workshops and one on one meetings. 2013 - 25 fishermen were trained on aquaculture via workshops and one-on-one meetings.
From 2011 - 2013, New Hampshire Sea Grant will transfer existing and emerging technologies and techniques that lead to increased selectivity and reduced by-catch to at least 20 commercial fishermen.	Yes	2012 - Since 2011, 25 commercial fishermen adopted the non-parallel bar shrimp grid, 5 commercial fishermen used the topless shrimp trawl, 21 commercial fishermen adopted the dual-grid, and 4 fishermen adopted the dog grate to eliminate dogfish bycatch in the small mesh fishery. 2013 - Since 2011, 25 commercial fishermen adopted the non-parallel bar shrimp grid, 5 commercial fishermen used the topless shrimp trawl, 21 commercial fishermen adopted the dual-grid, and 4 fishermen

		adopted the dog grate to eliminate dogfish bycatch in the small mesh fishery.
Knowledge gained from participation in extension programs is considered by resource managers.	Yes	2012 - Managers were engaged in the "Workshop on Reconciling Spatial Scales and Stock Structures for Fisheries." Also, 4 high-level mangers were present and participated in discussions exploring the controversial 2011 Atlantic cod stock assessment Fisheries Roundtable. 2013 - In 2013, 2 REDNET workshops presented marketing, gear and sustainability considerations for developing a redfish fishery in the Northeast.
More than 50% of NH commercial fishermen use conservation minded technology over traditional fishing methods.	Yes	2012 - Slow but steady progress is being observed as fishermen adopt more efficient fishing methods. Barriers include hesitancy to invest in new equipment given uncertainties in continued access to the resource. 2013 - This is difficult to track considering the dramatic loss of groundfish vessels off the N.H. Seacoast and the loss of shrimping season in the winter when conservation gear was broadly used in the industry. However, participation in research to develop innovative gear, and the LED accousting pinger program provided conservation minded tools that have been used by over 70 regional fishermen, including over half of the commercial ground fishermen in the state.
More than 50% of NH commercial fishermen use techniques that increase production efficiency or reduce fuel consumption.	No	2012 - Slow but steady progress is being observed as fishermen adopt more efficient fishing methods. Barriers include hesitancy to invest in new equipment given uncertainties in continued access to the resource. 2013 - This is difficult to track given the loss of groundfish vessels off the N.H. Seacoast. Concern among fishermen was more focused on lobster pricing and loss of fish quota and less on fuel efficiency. These more general, broad-stroke concerns seemed to lead to a dramatic decrease of interest in fuel efficiency measure among our fishermen.
New Hampshire Sea Grant designs, impliments and maintains the following online resources; NHSeafood.com, NH Sustainable Fisheries blog and the eXtension Sustainable Marine Fisheries community of practice.	Yes	2012 - In 2012, NHseafood.com was redesigned, leading to a 53% increase in visitorship. 2013 - We continue to maintain NHSeafood.com, the N.H. Sustainable Fisheries blog, and the eXtension Community of Practice. In addition, in 2013 we started both Twitter and Facebook pages.
New Hampshire Sea Grant will assist at least 1 business per year with the development or maintenance of HACCP programs.	Yes	2012 - 2 Histamine Producing Fish HACCP plans were developed, 1 Fish Smoking HACCP plan was developed, and 1 Lobster Processing HACCP plan was developed for N.H. fresh fish businesses. 2013 - 2 were developed during the 2013 reporting period.
New Hampshire Sea Grant will provide at least 2 training opportunities per year, that instruct participants on quality control, seafood handling and the HACCP approach to seafood safety.	Yes	2012 - As part of the 2 Trawl-to-Table workshops offered, 50 fishermen and seafood business owners were trained in the HACCP approach to seafood handling and quality control. 2013 - 2 trainings were conducted during the 2013 reporting period.
NH Sea Grant funded fisheries research is considered by management at the state and/or federal level.	Yes	2013 - IMTA research and demonstration directly impacted the EPA guidelines for small scale aquaculture in the Piscataqua River, N.H. The results proved that more nitrogen could be bioextracted (mussels and kelp) from the river than created by the fish grown in the cages. The current shellfish permitting process is also a result of Sea Grant funded research that now has 12 companies in business.
Online and social medai specific to fisheries and	Yes	2012 - As a result of the 2012 NHseafood.com re-design, the website has received a 53% increase in new

fishing practices are used by interested members of the public (goal 100 "hits"/month).		visitors with an average of 100 new visitors per month. 2013 - The N.H. Sustainable Marine Fisheries blog has an average of 1,000 page views/month. NHSeafood.com also has 1,190 views/month, 72% of which are new visitors, and Twitter and Facebook pages were also broadly used by consumers in 2013.
Sustainable seafood programs offered by NH Sea Grant are attended by 200 people annually.	Yes	2012 - A sustainable seafood dinner was held at UNH dining services that was attended by 750 individuals. 2013 - In 2013, this was accomplished through the N.H. Fresh and Local Seafood marketing campaign: N.H. Fish and Lobster Festival, N.H. Seafood Kickoff, guest lectures, Farmers Market Traveling Roadshow, and a series of 5 local seafood dinners.
Workshops and outreach programs that promote better understanding of fisheries management, policy and fishing practices are attended by 500 people annually.	Yes	2012 - Two Trawl-to-Table events in partnership with the Gulf of Maine Research Institute were held in Portland, Maine, and Portsmouth, N.H., and were each attended by 75 individuals. In addition, 4 fisheries roundtables were held promoting some element of improved understanding of fisheries management, policy and practices, each attended by 50 individuals. Videos were produced for fisheries roundtables that were viewed over 1,000 times in total. 2013 - In 2013, this was accomplished through the N.H. Fresh and Local Seafood marketing campaign: N.H. Fish and Lobster Festival, N.H. Seafood Kickoff, guest lectures, Farmers Market Traveling Roadshow, and a series of 5 local seafood dinners.