

Maine Sea Grant Performance Review Panel Report: Program Introduction

More than half of Maine's population of 1.3 million people lives in counties along the state's 5,300-mile coastline. Most are concentrated in the greater Portland area, which is also Maine's economic hub, while sparsely populated eastern coastal counties experience some of the nation's highest poverty rates. According to the National Ocean Economics Program, Maine's ocean economy, which includes coastal and marine-related industry and tourism, contributed more than \$2.4 billion to the state's GDP in 2012. These activities are the lifeblood of many of Maine's coastal communities, particularly in Midcoast and Downeast Maine, where economic activity is less diverse.

Maine Sea Grant is based at the University of Maine, the state's designated land and sea grant college, as well as its largest and oldest research institution. Management and communications teams based in Orono work closely with Maine Sea Grant's Marine Extension Team (MET), a formal partnership between Sea Grant and UMaine Cooperative Extension. The MET serves as a link between stakeholders and the research and policy that affects Maine communities. While each staff member has his or her own expertise and programs, we collaborate daily on crosscutting issues.

Demand for Maine Sea Grant's limited research and program development funds has increased steadily in recent years, as has our status as a trusted source of science-based information, and our focus on improving Maine people's access to the latest science. While our total investments may seem small, our influence is large relative to state capacity. For example, Maine participates in the NSF Experimental Program to Stimulate Competitive Research (EPSCoR), and Maine Sea Grant is a primary player in two current EPSCoR grants focused on sustainable aquaculture and coastal water quality.

As you review our activities and impacts, you will note that we far exceeded most of the targets set for our 2010-2013 strategic plan, which prompted a change in our process for identifying targets in subsequent plans. We have since made them more ambitious.

Here we describe our contributions to science and technology and societal impacts, with an emphasis on areas not covered in the companion report from the National Sea Grant "PIER" database. Where we include additional information on some impacts and accomplishments already reported, numbers in the margins refer to the corresponding statement number.



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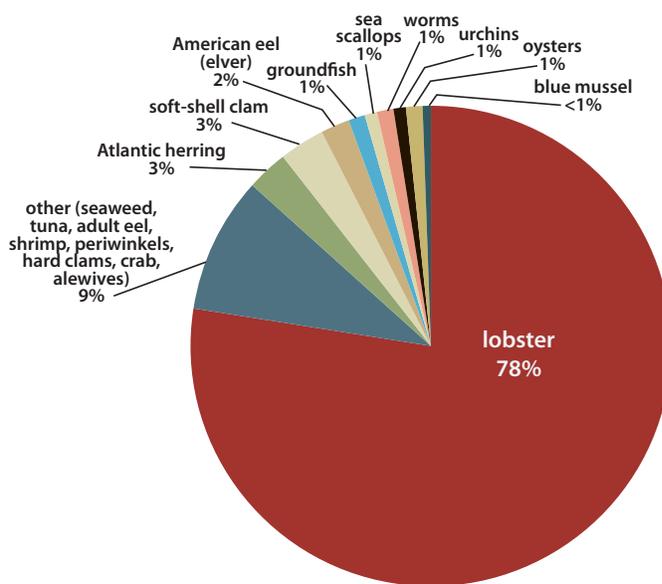
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Maine Sea Grant Performance Review Panel Report: Safe & Sustainable Seafood



Maine’s coastal communities rely on the sea for their economic and cultural livelihood. According to the National Marine Fisheries Service, the proportion of Maine workers employed in commercial fishing industries is more than ten times the national percentage, and commercial fisheries and aquaculture businesses in Maine are predominantly owner-operated. Yet Maine has lost most of its groundfish fleet and related infrastructure since 1980, and today a once-diverse fishing culture is overwhelmingly dependent on lobster, a vulnerable situation that one scientist has called “a gilded trap.”



Maine 2014 Seafood Landings by Ex-Vessel Value
Total value= \$585,348,370

Report reference numbers

New seafood businesses created with Maine Sea Grant assistance:

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- 1 lobster pounding business
- 5 seaweed farms
- 6 shellfish aquaculture businesses

Businesses sustained:

- 1 international salmon aquaculture company
- 3 seaweed farms
- 10 shellfish aquaculture businesses
- 12 independent fishermen retained through fisheries/aquaculture income diversification.
- 130 lobster fishing families estimated to have stayed in business as a result of the Trade Adjustment Assistance Program

Managing commercial fisheries

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Our work in this area is focused on fisheries managed at the state and/or community level, a scale at which our fishermen can get involved in science, monitoring, and management, and where communities can realize direct benefits from our work. Maine Sea Grant researchers have informed fisheries management through applied research in population dynamics, stock assessment, and sampling methodology.

15191



Brewer, J. 2011. Paper fish and policy conflict: catch shares and ecosystem-based management in Maine's groundfishery. *Ecology and Society* 16(1):15.

Brewer, J. 2014. Hog Daddy and the Walls of Steel: Catch shares and fish stories in the New England groundfishery. *Society and Natural Resources* 27(7):724-741.

Brewer, J. 2014. Harvesting a knowledge commons: collective action, transparency, and innovation at the Portland Fish Exchange. *International Journal of the Commons* 8(1):155-178.

Cao, J., Y. Chen, J.-H. Chang, and X. Chen. 2014. An evaluation of an inshore bottom trawl survey design for American lobster (*Homarus americanus*) using computer simulations. *Journal of Northwest Atlantic Fisheries Science* 46:27-39.

Cao, J., S.B. Truesdell, and Y. Chen. 2014. Impacts of seasonal stock mixing on the assessment of Atlantic cod in the Gulf of Maine. *ICES Journal of Marine Science: Journal du Conseil* 71(6): 1443-1457.

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Maine Department of Marine Resources and Plan Development Team. Fishery Management Plan for Rockweed (*Ascophyllum nodosum*), final report prepared for review by the Joint Standing Committee on Marine Resources of the 126th Maine Legislature, January 2014. Augusta, ME.

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McCarron, P., and H. Tetreault. 2012. Lobster pot gear configurations in the Gulf of Maine. Kennebunk, ME: Maine Lobstermen's Association, Consortium for Wildlife Bycatch Reduction, and New England Aquarium.

McMahan, M., D.C. Brady, D.F. Cowan, J.H. Grabowski, and G.D. Sherwood. 2013. Using acoustic telemetry to observe the effects of a groundfish predator (Atlantic cod, *Gadus morhua*) on movement of the American lobster (*Homarus americanus*). *Canadian Journal of Fisheries and Aquatic Sciences* 70:1625-1634.



Willis, T.V., K.A. Wilson, K.E. Alexander, and W.B. Leavenworth. 2013. Tracking cod diet preference over a century in the northern Gulf of Maine: historic data and modern analysis. *Marine Ecology Progress Series* 474:263-276.

Ying, Y., Y. Chen, L. Lin, and T. Gao. 2011. Risks of ignoring fish population spatial structure in fisheries management. *Canadian Journal of Fisheries and Aquatic Sciences* 68:2101-2120.

Zhao, J., J. Cao, S. Tian, Y. Chen, S. Zhang, Z. Wang, and X. Zhou. 2014. A comparison between two GAM models in quantifying relationships of environmental variables with fish richness and diversity indices. *Aquatic Ecology* 48:297-312.

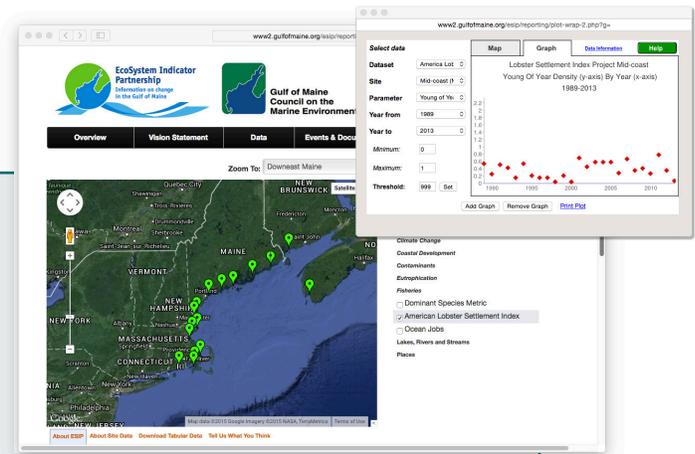
Zhang, Y., D. Brzezinski, J.H. Chang, K. Stepanek, and Y. Chen. 2011. Spatial structuring of fish community in association with environmental variables in the coastal Gulf of Maine. *Journal of North Atlantic Fisheries Science* 43:47-64.

Zhang, Y., and Y. Chen. 2012. Effectiveness of harvest control rules in managing American lobster fishery in the Gulf of Maine. *North American Journal of Fisheries Management* 32(5):984-999.

Zhang, Y., Y. Li, and Y. Chen. 2012. Modeling the dynamics of ecosystem for the American lobster in the Gulf of Maine. *Aquatic Ecology* 46:451-464.

Zhang, Y., Y. Chen, and C. Wilson. 2011. Developing and evaluating harvest control rules with different biological reference points for the American lobster (*Homarus americanus*) fishery in the Gulf of Maine. *ICES Journal of Marine Science* 68:1511-1524.

Maine Sea Grant researchers created the **American Lobster Settlement Index**, a measure of juvenile lobster populations throughout the North Atlantic, 25 years ago. The Index is used by state/provincial and national regulatory agencies in the United States and Canada to assess and manage the lobster stock. Recent Sea Grant funding supported development of a web portal for data viewing and analysis, and a tool for forecasting the fishery.



Burdett-Coutts, V.H.M., R.A. Wahle, P.V.R. Snelgrove, and R. Rochette. 2014. Spatial linkages between settling young-of-year and older juvenile lobsters. *Marine Ecology Progress Series* 499:143-155.

Pershing, A., R.A. Wahle, P. Meyers, and P. Lawton. 2013. Large-scale coherence in New England lobster settlement associated with regional weather. *Fisheries Oceanography* 21:348-362.

Sigurdsson, G.M., B. Morse, and R. Rochette. 2014. Light traps as a tool to sample pelagic larvae of American lobster (*Homarus americanus*). *Journal of Crustacean Biology* 34(2):182-188.

Wahle, R.A., C.E. Bergeron, J. Tremblay, C. Wilson, V. Burdett-Coutts, M. Comeau, R. Rochette, P. Lawton, R. Glenn, and M. Gibson. 2013. The geography and bathymetry of American lobster benthic recruitment as measured by diver-based suction sampling and passive collectors. *Marine Biology Research* 9:42-58.

In 2012, Maine Sea Grant coordinated and hosted an **international symposium on the American lobster**, attended by 150 researchers, students, fishermen, and managers. The symposium led to nine papers in a special issue of the *Canadian Journal of Fisheries and Aquatic Sciences*, new research collaborations, and a second symposium to be held in Prince Edward Island this fall.



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Maine is home to 11 species of diadromous or sea-run fish, some of which still support commercial fisheries. As a result, Maine is a leader in restoring habitat for migratory fish. Our work in this area has informed research and management within and outside of Maine. For example, NOAA contracted with Maine Sea Grant to coordinate a series of **workshops on Atlantic salmon in the marine environment**. We convened and facilitated a multidisciplinary team of scientists and wrote the final synthesis report, which led to numerous research projects on endangered Atlantic salmon and a new estuarine survey effort by NOAA Fisheries.

Anderson, P., and C. Schmitt (eds). Marine Ecology of Gulf of Maine Atlantic Salmon, summary document from a 2008-2010 series of workshops, MSG-TR-12-01. Orono, ME: Maine Sea Grant College Program.

We conducted field work and coordinated volunteers whose data enabled a statewide **assessment of rainbow smelt**, a federal species of concern.

Enterline, C.L., B.C. Chase, J.M. Carloni, and K.E. Mills. 2012. A regional conservation plan for anadromous rainbow smelt in the U.S. Gulf of Maine. Augusta, ME: Maine Department of Marine Resources.

Kovach, A.I., T.S. Breton, C. Enterline, and D.L. Berlinsky. 2013. Identifying the spatial scale of population structure in anadromous rainbow smelt (*Osmerus mordax*). *Fisheries Research* 141:95-106.



A Maine Sea Grant **study of dam removal** in a tributary of the Penobscot River has informed river restoration efforts throughout the state, results which have been shared nationally and which contributed to our involvement in NOAA's **Penobscot River Habitat Focus Area**.

Demi, L.M., K.S. Simon, S.M. Coghlan Jr., R. Saunders, and D. Anderson. 2012. Anadromous alewives in linked lake-stream ecosystems: do trophic interactions in lakes influence stream invertebrate communities? *Freshwater Science* 31(3):973-985.

Gardner, C., S.M. Coghlan Jr., J. Zydlewski, and R. Saunders. 2011. Distribution and abundance of stream fishes in relation to barriers: implications for monitoring stream recovery after barrier removal. *River Research and Applications* DOI:10.1002/rra.1572.

Gardner, C., S.M. Coghlan Jr., and J. Zydlewski. 2012. Distribution and abundance of anadromous sea lamprey spawners in a fragmented stream: current status and potential range expansion following barrier removal. *Northeastern Naturalist* 19(1):99-110.

Hogg, R., S.M. Coghlan Jr., J. Zydlewski, and K.S. Simon. 2014. Anadromous sea lampreys (*Petromyzon marinus*) are ecosystem engineers in a spawning tributary. *Freshwater Biology* 59(6):1294-1307.

Hogg, R., S.M. Coghlan Jr., and J. Zydlewski. 2013. Anadromous sea lampreys recolonize a Maine coastal tributary after dam removal. *Transactions of the American Fisheries Society* 142(5):1381-1394.

Advancing sea vegetable and shellfish industries

Maine Sea Grant has served as a trusted leader in aquaculture research and development in Maine since we helped to establish the oyster aquaculture industry beginning in the 1970s. Our work in aquaculture has evolved and expanded with the growth of the industry, and includes continued development of new culture techniques and target species (scallops, razor clams, soft-shelled clams, Artic surf clams) , as well as marketing and industry support. 17055
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Over the past four years, we have maintained our role as technical advisors, group decision-making process facilitators, and coordinators of shellfish and seaweed aquaculture working groups. In 2011, we expanded our capacity with a National Sea Grant Aquaculture Extension National Strategic Initiative grant that enabled hiring of an extension associate with expertise in marine macroalgae, with the resulting impacts described in the companion report.

Developing culture methods for sea vegetables involves learning more about the basic biology and genetics of native algae species. We have funded basic research along these lines, with related efforts to **develop new seaweed culture nursery capacity** at the UMaine Center For Cooperative Aquaculture Research. 20845
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Blouin, N.A., and S.H. Brawley. 2012. An AFLP-based test of clonality in widespread, putatively asexual populations of *Porphyra umbilicalis* (Rhodophyta) in the Northwest Atlantic with an in silico analysis for bacterial contamination. *Marine Biology* 159:2723-2729.

Blouin, N.A., J.A. Brodie, A.C. Grossman, P. Xu, and S.H. Brawley. 2011. *Porphyra*: a marine crop shaped by stress. *Trends in Plant Science* 16(1):29-37.

Brawley, S., S. Redmond, and N. Brown. Pilot production of native *Porphyra* for land and sea-based IMTA, Final Report, Project No. 12-06. Orono, ME: Maine Aquaculture Innovation Center.

Chan, C.X. et al. 2012. *Porphyra* (Bangiophyceae) transcriptomes provide insights into red algal development and metabolism. *Journal of Phycology* 48:1328-1342.

Chan, C.X. et al. 2012. Analysis of *Porphyra* membrane transporters demonstrates gene transfer among photosynthetic eukaryotes and numerous sodium-coupled transport systems. *Plant Physiology* 158:2001-2012.

Stiller, J.W. et al. 2012. Major developmental regulators and their expression in two closely related species of *Porphyra* (Rhodophyta). *Journal of Phycology* 48:883-896.

Although MSX, a disease caused by a single-celled Protozoan parasite, has been present in Maine before, in 2010 **a large-scale outbreak occurred in the Damariscotta River**, the heart of Maine's oyster growing industry. With funds from both Maine Sea Grant and the National Sea Grant Office, the industry, the state, the university, and a private laboratory worked together immediately to develop and implement a surveillance program, including testing of oyster operations coastwide. The results served to ease the concerns of growers outside of the Damariscotta River by confirming that MSX was in fact contained within that one estuary. Additionally, baseline surveillance data for the natural and farmed populations in the Damariscotta River has been established, preventing the spread of MSX and limiting the economic impact on growers.



Larsen, P.F., K.A. Wilson, and D.L. Morse. 2013. Observations on the expansion of a relict population of Eastern oysters (*Crassostrea virginica*) in a Maine estuary: implications for climate change and restoration. *Northeastern Naturalist* 20(4):N28-N32.

Messerman, N.A., K.E. Johndrow, and T.J. Bowden. 2014. Prevalence of the protozoan parasite *Haplosporidium nelsoni* in the Eastern oyster, *Crassostrea virginica*, within the Damariscotta River Estuary, in Maine, USA in 2012. *Bulletin of the European Association of Fish Pathologists* 34(2):54-62.

20864 We supported the Gulf of Maine’s nearshore scallop fishery through collaborative research that engaged industry members in developing, refining, and improving hatchery **production and nursery techniques for cultured sea scallops** and to develop baseline data on biotoxin loads of cultured scallops.

Building resilient fishing communities

6717 Maine’s fishing communities are experiencing the cumulative effects of fish stock depletion, state and
6722 federal regulations, coastal development and demographic changes, and rising fuel and energy costs.

To help state and federal agencies assess fishery regulations on communities, Maine Sea Grant researchers explored how those living within **four Maine fishing communities understand their resilience**.

Johnson, T.R., A. Henry, and C. Thompson. 2014. Identifying qualitative indicators of social resilience in small-scale fishing communities: an emphasis on perceptions and practice. *Human Ecology Review* 20(2):97-115.

Johnson, T.R., A. Henry, and C. Thompson. 2014. In *Their Own Words: Fishermen’s Perspectives of Community Resilience*. Orono, ME: Maine Sea Grant College Program.

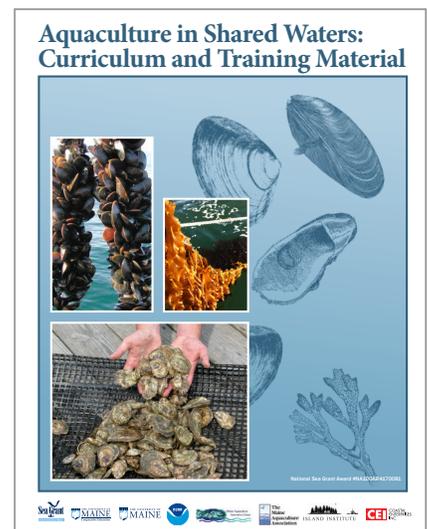


15200 With such a large percentage of communities dependent on marine resources, Maine Sea Grant was an early leader in state and national efforts to maintain and protect working waterfront assets and access to the shoreline. We helped to create the National Working Waterfront Network, an outcome of the 2007 and 2010 Working Waterways and Waterfronts National Symposia on Water Access, hosted in Virginia and Maine, respectively. In 2011, the U.S. Department of Commerce Economic Development Administration entered into a \$533,000 cooperative agreement with Maine Sea Grant, National Sea Grant Law Center, Florida Sea Grant, Virginia Sea Grant, Island Institute, Coastal Enterprises Inc., Urban Harbors Institute at University of Mass/Boston, National Marine Manufacturers Association, NOAA, and the Maine Coastal Program to develop and launch the **Sustainable Working Waterfronts Toolkit**. Our working waterfront efforts have also influenced legislation at the state and federal level.

Diversification and business training are other aspects of building resilient fishing communities. We coordinated the process of organizing and implementing the USDA’s **Trade Adjustment Assistance Program for the lobster fishery** in five Northeastern states, which delivered business training and technical and financial assistance to more than 4,000 lobster fishing families in the region, and 1,328 individuals completed in-depth business plans.

20846 We developed and delivered a 12-week **aquaculture training for commercial fishermen** interested in business diversification, and identified best practices for continuing this effort in 2015 through social science research conducted by UMaine investigators and students.

15215 Fishermen can stay in business by finding new ways to connect to consumers. We provided financial and planning support for the **National Summit on Community Supported Fisheries**, organized by New Hampshire Sea Grant, which brought together 75 CSF organizers, fishermen, and community leaders to explore the challenges and opportunities associated with the emerging model.





Tourism is one way that fishermen and aquaculturists can continue to work on the water while taking advantage of “Maine’s largest industry.” Legal research on barriers to collaboration among and between commercial fishermen, aquaculturists, and tourism providers, funded by the National Sea Grant Law Center, was translated into workshops, a series of fact sheets, and web content. Workshop participants have used information on topics such as insurance and liability, permitting, licensing, and contracting in developing plans to augment their business portfolios and income.

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FISHERIES & TOURISM
FACT SHEET #1000

Overview

Special opportunities for people interested in participating in water-based activities while enjoying the outdoors while continuing to work on the water. Tools for identifying, while and boat-safety, coastal fishing and recreation while enjoying water resources. Fisheries and aquaculture farmers begin to use their knowledge, their vessels, and fisheries infrastructure in unique ways in the coastal zone.

However, obstacles to diversification do exist, especially concerning licensing, liability, and other business concerns, and contracting with partners.

In 2011, Maine Sea Grant received funds from the National Sea Grant Center to conduct a fact sheet series for fishermen and aquaculturists on their consider contracting in the marine industry. The research was conducted by a Sea Grant Fellow and has resulted in the Fisheries and Aquaculture Fact Sheet Series, which is presented to you through this fact sheet.

Developing Business Partnerships between Fisheries and Tourism, is available at the project web site: www.seagrant.maine.edu/fishertourism.

The Fisheries & Tourism Fact Sheet Series provides basic information to help fishermen and aquaculturists develop business partnerships.

Topics in the series:

- Partnerships
- What makes a great tour?
- Marketing 101
- Equipment
- Fishing licenses
- Capita's Expenses
- Food requirements
- Maritime Law & Liability
- Business models

In the last five years, Sea Grant has led the revival and expansion of the Downeast Fisheries Trail, a fishing heritage education and tourism initiative in eastern Maine. Through collaboration with the 45 sites on the Trail, we installed 12 new interpretive panels, produced an oral history video series highlighting harvester knowledge of eel and alewife fisheries, and published an annual online literary journal focused on the region’s fisheries heritage. Collaborations between Downeast Fisheries Trail and Experience Maritime Maine, Two Nation Vacation, and Downeast and Acadia Regional Tourism are enabling travellers to connect with fisheries and aquaculture heritage in ways that were previously unavailable.

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Downeast Fisheries Trail
Sentier Downeast Fisheries Trail

From Penobscot Bay to Passamaquoddy Bay, the Downeast Fisheries Trail connects sites, such as museums and community resource centers, that illustrate the region's maritime heritage past and present. Also included are places where the stories of people and the sea are intertwined, such as fishing harbors, clam flats, herring weirs, fish hatcheries, aquaculture facilities, and seafood processing plants. Visitors can explore the whole trail over a few days, or visit a few sites in one region to learn how they sustain the culture and economy of Downeast Maine and Coastal Charlotte County, New Brunswick.

De la baie Penobscot à la baie Passamaquoddy, le sentier Downeast Fisheries Trail relie des haltes telles que des musées et des centres de ressources communautaires qui illustrent le patrimoine maritime régional et local de la région. Ce sentier est également jalonné de lieux où s'entremêlent les récits de la présence humaine et de la mer, sur lesquels reposent les ports de pêche, des vastes pagères de crevettes, des usines de transformation des produits de la mer. Les visiteurs peuvent explorer le sentier complet en l'espace de quelques jours ou visiter certaines haltes d'un secteur donné pour découvrir de quelle manière les ressources marines soutiennent la culture et l'économie du Downeast Maine et de la zone côtière du comté de Charlotte, au Nouveau-Brunswick.

Downeast Fisheries Trail.org
The Downeast Fisheries Trail and Brunswick County's Coastal Community Park are both part of the Two-Nation Vacation.
Two-Nation-Vacation.com

Sometimes fishery rule changes resulted in behaviors that affect the safety of fishermen. Maine Sea Grant research on fishing safety has influenced safety training requirements and apprenticeship programs for multiple fisheries. We supported a NOAA survey crew mapping of an area of Cobscook Bay that experiences high rates of fishing fatalities, and provided funding and staff coordination for a U.S. Coast Guard-approved Fishing Vessel Drill Conductor Certification course for commercial fishermen.

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Backus, A., and M.E. Davis. 2011. Occupational safety and compliance in the Maine commercial fishing industry: status report and policy recommendations, July 2011. Medford, MA: Tufts University.

Davis, M.E. 2011. Occupational safety and regulatory compliance in US commercial fishing. *Archives of Environmental and Occupational Health* 66(4):209-216.

Davis M.E. 2012. Perceptions of occupational risk by US commercial fishermen. *Marine Policy* 36:28-33.

PIER PRP Program Focus Area Report

Maine Sea Grant

Safe and Sustainable Seafood Supply

Program Focus Area: SUSTAINABLE SEAFOOD

Program Goals

1. Wild harvest and culture fisheries and the communities that depend on them are economically viable and environmentally sustainable.

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[Full Text of Impacts](#)

[Program Performance Measures](#)

[Objectives](#)

Impacts and Accomplishments toward Program Goals

1. **Program Goal: Wild harvest and culture fisheries and the communities that depend on them are economically viable and environmentally sustainable.**

Impact(s)

- o [20846](#) - Sea Grant provides aquaculture training for commercial fishermen in Maine
- o [20843](#) - Sea Grant advances Maine's sea vegetable industry
- o [20834](#) - Maine Sea Grant captures fishermen's knowledge about sea-run fish
- o [18721](#) - Maine Sea Grant obtained and coordinated business development training and financial assistance for 4,000 lobstermen in New England.
- o [18720](#) - Sea Grant helps local communities maintain harvest rights to river herring.
- o [18695](#) - The American Lobster Settlement Index provides crucial data for assessing the future of the lobster industry.
- o [17095](#) - Sea Grant stimulates seaweed industry in Maine.
- o [17055](#) - Sea Grant facilitates development of techniques to produce blue mussel seed for use in integrated multitrophic aquaculture applications.
- o [15204](#) - Maine Sea Grant helps create new model to sustain and enhance safety of community fishing jobs.
- o [15202](#) - Maine Sea Grant helps to create businesses in the aquaculture sector.
- o [15200](#) - Maine Sea Grant helps create National Working Waterfront Network.
- o [15197](#) - Maine Sea Grant research results in cost savings, improved efficiency for state lobster assessment program.
- o [15191](#) - Maine Sea Grant research helps fishing communities make ecosystem-based management decisions.
- o [6726](#) - Maine Sea Grant identifies hazards of the fishing life
- o [6717](#) - Maine Sea Grant keeping fishing heritage alive
- o [6693](#) - Maine Sea Grant builds capacity for community-supported fisheries

Accomplishment(s)

- o [20864](#) - Sea Grant supports, enhances, and expands the Gulf of Maine's nearshore scallop fishery
- o [20836](#) - Maine Sea Grant helps residents evaluate aquaculture's role in their community's future
- o [18814](#) - Maine Sea Grant helps create and support a sea vegetable industry.
- o [18723](#) - Sea Grant works to diversify Maine's shellfish aquaculture products.
- o [18718](#) - Maine creates management plan for major seaweed industry.
- o [17059](#) - New trail highlights fisheries heritage in eastern Maine.
- o [15215](#) - Maine Sea Grant creates comprehensive guide to local seafood.
- o [15210](#) - Sea Grant research on radioactive fallout from Japan nuclear disaster confirms safety of edible seaweeds.
- o [6724](#) - Maine Sea Grant supports engagement of fishermen in resource management
- o [6722](#) - Maine Sea Grant research identifying fishing community resilience factors and threats

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Full Text of Impacts and Accomplishments

20864 - Sea Grant supports, enhances, and expands the Gulf of Maine's nearshore scallop fishery

The wild sea scallop fishery in the coastal Gulf of Maine is characterized by low volume, high quality, and high prices. Industry and managers are making progress in rebuilding the resource, raising

interesting questions about scallop biology and population dynamics, while some fishermen have sustained interest in scallop aquaculture and additional scallop products, but they are limited by Maine laws that prohibit the sale of whole or "roe-on" scallops.

Sea Grant helped sponsor and organize the first ever U.S.-Canada Scallop Summit, where 35 representatives of science, management, industry and educational institutions addressed issues related to resource management, the current state of scientific knowledge, and information exchange. Through program development funding and extension, Sea Grant supported experiments in scallop aquaculture along the Maine coast to develop baseline data on biotoxin loads of cultured scallops.

Informed by the results of culture experiments, the Maine Department of Marine Resources updated their Memorandum of Understanding with scallop aquaculturists to permit sales of scallop products other than just adductor muscles. For the first time in Maine, at least four new scallop farms sold live product to restaurants (\$2,000), and at least two producers sold wild-collected scallop seed (\$1,000). As an outcome of the Summit, four collaborative scallop research projects were selected for funding in 2014-2015.

RECAP: Maine Sea Grant applied funding, administration, and extension capacity to increase collaborate research and development on Atlantic sea scallops.

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20846 - Sea Grant provides aquaculture training for commercial fishermen in Maine

Relevance: Uncertainty and decreasing opportunity in Maine's commercial marine resources has fishermen looking for alternatives, such as aquaculture. Training and support increase the chances of success for new aquaculture businesses.

Response: In 2013, Maine Sea Grant and its partners began an 11-week training course for two cooperatives of fishermen in Harpswell and Corea, Maine. The group created a comprehensive curriculum for delivery to 12 fishermen, including tours of existing aquaculture operations. University of Maine researchers are studying the process, and measuring the changes in perception and knowledge that can accompany training.

Results: One fisherman began a new marine aquaculture business producing oysters and mussels, with others in preparatory stages. Meanwhile, commercial shellfish harvesters and lobstermen in the towns of Brunswick and Harpswell requested that the course be offered again to their communities. Twenty fishermen are registered for the 2015 course. Through social science research coordinated at the University of Maine, the group has an improved understanding of the best practices for teaching the topic to commercial fishermen.

RECAP: Maine Sea Grant provided fishermen with training and support in marine aquaculture to expand their options for working on the water, and one fisherman has already started a sea farming business.

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20843 - Sea Grant advances Maine's sea vegetable industry

RELEVANCE: Globally, seaweeds represent an \$8 billion industry, which presents several opportunities to fishermen and sea farmers in Maine's coastal environment, especially given the continued restrictions in several major state and federal fisheries. As a new industry in the USA, there are specific opportunities for Maine entrepreneurs, building upon environmental health, name recognition, and expertise in marine-related business and science.

RESPONSE: Maine Sea Grant is a leader in bringing local sea vegetables to market through research, education, and outreach. New nursery cultivation techniques for native species are under development with Sea Grant support, and funding from the Maine Aquaculture Innovation Center provided for transfer of seaweed cultivation technology to industry. In 2014, Sea Grant provided approximately 5,600 feet of seeded lines to 9 sea farmers, 1 educational facility, and 1 aquaculture researcher for trial on their farms. Restaurants, food trucks, and chefs are experimenting with wild and cultured seaweeds, and consumers are learning about the ecology, variety, and benefits through outreach and education.

RESULTS: Support from Sea Grant enabled 6 new sea farms to be established in 2014, and has led to the development of new options for sea farmers and new products at Maine businesses, including a kelp beer, seaweed ice cream, and seaweed bagels. Sea Grant supported the first ever Maine Seaweed Festival, which brought together seaweed producers from the wild harvest and aquaculture industries, businesses, food trucks, chefs, educators, students, consumers, and families to celebrate and learn about Maine's seaweeds. Media attention to these efforts helped further promote and support Maine's sea vegetable industry, and raise awareness of sea vegetables as a food.

RECAP: Maine Sea Grant is providing key support in the development and expansion of Maine's sea vegetable industry through aquaculture research, harvester outreach, product development, and consumer education.

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20836 - Maine Sea Grant helps residents evaluate aquaculture's role in their community's future

RELEVANCE: As shellfish aquaculture expands in Maine, some communities question its role in their future. Residents are concerned about the rate of growth while industry members are worried about policy that restricts that growth. In one community, oyster farming has erupted into a controversial issue pitting neighbor against neighbor, and revealing deep frustration at managers, creating a need for communication and science-based information about the effects of shellfish farming,

RESPONSE: In 2014, Sea Grant facilitated two public meetings (270 attendees total) to enable community members, industry and managers begin an open dialogue about shellfish farming in the community.

RESULTS: What started as a process filled with extremely angry people culminated in a true community dialogue. By the end of the meetings, people by no means all agreed with each other, but they had communicated with respect, willingness to listen, and honesty about their respective views. Sea Grant helped avoid further conflict and allow for exchange of science-based information.

RECAP: In a community where proposals for new marine aquaculture leases became controversial, Sea Grant facilitated two public meetings attended by nearly 300 people that enabled community members, industry and managers to begin an open dialogue about shellfish farming in the local watershed. [Back to Goals](#)

20834 - Maine Sea Grant captures fishermen's knowledge about sea-run fish

RELEVANCE: Sea-run, or diadromous, fish form the link between rivers and the ocean, and are believed to play a critical role in the restoration of commercially important food fish such as cod. However, many of these fish are at or near all-time lows in abundance and are being considered for listing under the Endangered Species Act. Maine is one of the few states that still has traditional, commercial fishery for three of these species: American eel, alewife, and blueback herring.

RESPONSE: With funding from NOAA's Preserve America Initiative, Sea Grant worked with NOAA Fisheries staff and a recently graduated Sea Grant-supported Master's student to conduct a series of interviews to capture harvesters' deep and unique knowledge about eels and river herring, seagrant.umaine.edu/oral-histories-alewife-eel.

RESULTS: NOAA Fisheries, realizing the value of fishermen's knowledge, launched a coastwide survey of alewife harvesters from Maine to North Carolina, information which will be critical for effective evaluation of whether or not to list the alewife as an endangered species.

RECAP: Supported by a NOAA Preserve America grant, Sea Grant worked with NOAA Fisheries to capture, for the first time, harvesters' knowledge of eels and river herring. As a result of (and modeled on) this project, NOAA Fisheries launched a survey of alewife harvesters from Maine to North Carolina which will help inform Endangered Species Act status. [Back to Goals](#)

18814 - Maine Sea Grant helps create and support a sea vegetable industry.

RELEVANCE Maine is home to several successful sea vegetable companies who have relied on sustainable wild harvest for their product for 30+ years. Globally, seaweeds represent an \$8 billion industry, which presents several opportunities to fishermen and sea farmers in Maine's coastal environment, especially given the continued restrictions in several major state and federal fisheries. Maine is home to the first commercial kelp farm in the US, with innovations in culture technologies and product types. Increased attention to sea vegetables as a hip new health food, concerns over food biosecurity of imported foods, a changing ocean climate, and the development of new culture techniques for sea vegetables are all contributing to an increased awareness of the limits of the wild-harvested resource as well as a new interest in sea vegetable cultivation.

RESPONSE Maine Sea Grant created a new marine extension position specializing in seaweeds in 2011. In her first year of service, the extension associate has raised awareness and enthusiasm for the development of a seaweed culture industry in Maine through research, outreach, and collaboration with the existing seaweed companies, shellfish farmers, and educational facilities around the state. Sea Grant established a sea vegetable research and educational nursery in Franklin, Maine to support the new industry and provide educational and training opportunities for interested individuals or groups.

RESULTS Since 2012, Maine Sea Grant has provided over 8,750 feet of seeded kelp line to sea farmers. Support from Sea Grant enabled 6 new sea farms to be established in 2014, and has led to the development of new options for sea farmers and new products at Maine businesses, including a kelp beer, seaweed ice cream, and seaweed bagels. Maine Sea Grant has also worked together with educational institutions to develop two new seaweed nurseries for student engagement in Maine, serving middle school, undergraduate, and graduate level students. Restaurants, food trucks, and chefs are experimenting with wild and cultured seaweeds, and consumers are learning about the ecology, variety, and benefits through outreach and education. Sea Grant supported the first ever Maine Seaweed Festival, which brought together seaweed producers from the wild harvest and aquaculture industries, businesses, food trucks, chefs, educators, students, consumers, and families to celebrate and learn about Maine's seaweeds. Media attention to these efforts helped further promote and support Maine's sea vegetable industry, and raise awareness of sea vegetables as a food.

RECAP: Maine Sea Grant has played a central role in the development of new efforts for sea vegetable aquaculture and education around the state. [Back to Goals](#)

18723 - Sea Grant works to diversify Maine's shellfish aquaculture products.

RELEVANCE The shellfish aquaculture industry of the eastern United States depends heavily on three species (eastern oysters, hard clams, and blue mussels) and diversification is needed to ensure resilience of the industry and sustainability of marine resources.

RESPONSE Working closely with partners in the region, Maine Sea Grant has applied extension

capacity and program development funds to engage industry members to inform research on hatchery production and nursery techniques for cultured sea scallops (*Placopecten magellanicus*) and razor clams (*Ensis directus*). The transparent process allows interested parties to track project progress, and submit suggestions for future research and development. Sea Grant also provides field support to gather data necessary for evaluating progress.

RESULTS Five companies in Maine are now engaged in culturing sea scallops, where previously there were none. A suite of engaged industry partners are ready to serve as collaborators in growout trials, once the next hatchery phase produces razor clam juveniles for outplanting. The groundwork is in place for the important monitoring and testing protocols that will need to occur for producers to sell whole, live or roe-on sea scallops.

RECAP: Maine Sea Grant and partners are working toward commercialization of cultured sea scallops (*Placopecten magellanicus*) and razor clams (*Ensis directus*), both of which have excellent market potential. [Back to Goals](#)

18721 - Maine Sea Grant obtained and coordinated business development training and financial assistance for 4,000 lobstermen in New England.

RELEVANCE Harvest of the American lobster is Maine's most important fishery as measured in landings, employment, and value. In 2009, the value of Maine lobster declined by more than 15%, in part because of increased foreign imports.

RESPONSE Maine Sea Grant worked with the Maine Lobstermen's Association, colleagues at five other Northeast region Sea Grant programs, and their many partners to apply on behalf of all Northeastern lobstermen to the USDA Trade Adjustment Assistance Program, which targets commodities that have experienced reduced revenue and negative impacts from imports. Maine Sea Grant coordinated the implementation of the TAA program in the Northeast region, AND collaborated in design, creation, and implementation of several workshop topics.

RESULTS The TAA program provided a needed structure for the delivery of technical, business, and financial assistance to producers, and stimulated efforts to upgrade the industry on several levels. The TAA program resulted in the delivery of relevant business and technical assistance to more than 2,000 lobstermen in Maine, and 4,000 in the region. In 2013, Maine families and lobster businesses received \$1.43 million in payments.

RECAP: Maine Sea Grant worked with national and regional partners to organize and implement the USDA's Trade Adjustment Assistance Program for the lobster fishery in five Northeastern states. [Back to Goals](#)

18720 - Sea Grant helps local communities maintain harvest rights to river herring.

RELEVANCE Alewife and blue-backed herring (jointly known as river herring) migrate from the ocean to spawn in Maine's fresh water lakes and rivers. Historically these fish were a source of food in coastal communities; they remain important today as sustenance, as part of cultural heritage activities, and as lobster bait. State and municipal leaders work in partnership to ensure that river herring have unobstructed upstream passage to sustain future generations. In 2011, the town of Pembroke's authority to govern the harvest of river herring was revoked because of failure to meet state requirements.

RESPONSE In 2012, Maine Sea Grant began coordinating the required monitoring of river herring in Pembroke.

RESULTS In 2013, harvest of river herring was restored in Pembroke.

RECAP: Maine Sea Grant's coordination of a monitoring program for fish populations allowed a community to regain fishing rights. [Back to Goals](#)

18718 - Maine creates management plan for major seaweed industry.

RELEVANCE Rockweed (*Ascophyllum nodosum*) is a brown seaweed that dominates Maine's rocky shorelines. Humans have long harvested rockweed for various uses, but recently the commercial harvest has increased, leading to conflict with other uses and values of the coast. In 2013, the Maine legislature directed the Commissioner of Marine Resources to create a fisheries management plan for rockweed.

RESPONSE At the Department's request, Maine Sea Grant assisted with the plan, facilitating meetings of the development team and providing guidance on procedures for respectful collaboration and decision-making.

RESULTS The Fisheries Management Plan for Rockweed was completed in January 2014 and submitted to the Joint Standing Committee of Marine Resources. It is expected that the recommendations in the document will lead to regulatory changes for rockweed harvests in 2014.

RECAP: Maine Sea Grant assisted the Maine Department of Marine Resources with facilitating the development of a fisheries management plan for rockweed (*Ascophyllum nodosum*). [Back to Goals](#)

18695 - The American Lobster Settlement Index provides crucial data for assessing the future of the lobster industry.

RELEVANCE The American lobster fishery is the largest single-species fishery in the Gulf of Maine and

Atlantic Canada. The collapse of this fishery would be catastrophic to the coastal economy. Developing forecasting tools for trends in the lobster fishery is not only useful to the fishing industry and managers, but has value to associated businesses, local municipalities, and financial institutions whose communities and revenues are strongly influenced by the lobster fishery.

RESPONSE Now in its 24th year, the American Lobster Settlement Index monitors lobster nurseries in New England and Atlantic Canada. The resulting long-term dataset for the fishery has allowed scientists to measure change in fish populations and their ecosystems. In 2013, Sea Grant researchers developed a web portal for project partners to access the long-term data set.

RESULT As a key indicator of the health of the region's lobster fishery, the American Lobster Settlement Index is used by the Atlantic States Marine Fisheries Commission, National Marine Fisheries Service, Canada Department of Fisheries and Oceans, and state fisheries agencies for assessing the lobster stock. It was instrumental in manager recommendations to place a moratorium on lobstering in southern New England, although the recommendation was not adopted, less conservative conservation measures were adopted in 2013.

RECAP: Sea Grant helped develop the American Lobster Settlement Index more than two decades ago. Since that time, the monitoring program has expanded throughout northeastern North America and is used to manage and understand lobster populations. [Back to Goals](#)

17095 - Sea Grant stimulates seaweed industry in Maine.

RELEVANCE: Maine is home to several successful sea vegetable companies who have relied on sustainable wild harvest for their product for 30+ years. Maine is also home to the first commercial kelp farm in the US, with innovations in culture technologies and product types. There is very little expertise and few resources available for the development of seaweed aquaculture in the US, yet seaweeds have a multitude of uses and benefits, and the development of a seaweed aquaculture industry can stimulate growth in the existing sea vegetable industry, encourage the development of new products, allow for diversification and integration on existing sea farms, encourage new entries into the aquaculture industry, and play a role in ecosystem services.

RESPONSE: Maine Sea Grant created a new marine extension position specializing in seaweeds in 2011. In her first year of service, the extension associate has raised awareness and enthusiasm for the development of a seaweed culture industry in Maine through research, outreach, and collaboration with the existing seaweed companies, shellfish farmers, and educational facilities around the state.

RESULTS: Collaboration with new farmers resulted in seven shellfish farms cultivating sugar kelp during the 2011-2012 winter and four shellfish farmers cultivating sugar kelp and other red seaweeds (dulse and laver) on their sites during 2012-2013 in an attempt to develop successful husbandry techniques and sea vegetable products for market. Sea Grant established a sea vegetable research and educational nursery in Franklin, Maine to support the new industry and provide educational and training opportunities for interested individuals or groups. The development of seaweed cultivation is also stimulating new research, including utilizing the technology for bioremediation, for feed production for other cultured organisms, and new product development.

RECAP: Sea Grant is bringing together industry, educators, students, and regulators to develop a new sea vegetable culture industry in Maine through research, collaboration, and partnership. [Back to Goals](#)

17059 - New trail highlights fisheries heritage in eastern Maine.

RELEVANCE: Residents and visitors can easily overlook the vital role of fisheries in Maine history, and they don't always recognize that even today, despite the drastic changes in fish populations and management, fisheries continue to drive much of the economy and culture of Downeast Maine. As Maine's fisheries have declined, communities are losing the "social memory" that contributes to their identity and resilience. Stories of fisheries past and working waterfronts present must be continually retold and transformed by communities seeking economic development and quality of life.

RESPONSE: Maine Sea Grant coordinated dozens of partners to identify and thematically link 45 sites, from museums to historical societies, from fish hatcheries to fish weirs and more, that together illustrate the region's maritime heritage and build on these local resources. In 2012, we produced a map brochure highlighting the 45 sites on the Trail, created a website and developed multimedia content, produced five interpretive panels for installation at sites along the Trail, coordinated media and publicity for the launching event, and produced a 2013 calendar to promote the new initiative.

RESULTS: In 2012, thousands of people were made aware of the region's fisheries heritage through a brochure map of 45 sites, a launching celebration, website, Facebook page, five new interpretive panels, and exhibiting at more than a dozen events.

RECAP: Maine Sea Grant coordinated the creation of the Downeast Fisheries Trail, which celebrates fisheries heritage then and now at 45 sites that illustrate the region's maritime heritage and builds on these local resources to strengthen community life and the experience of visitors. [Back to Goals](#)

17055 - Sea Grant facilitates development of techniques to produce blue mussel seed for use in integrated multitrophic aquaculture applications.

RELEVANCE: Aquaculture companies attempting to integrate shellfish into finfish farming operations face challenges with sourcing supplies of juveniles, or seed.

RESPONSE: Maine Sea Grant set up meetings between the Cooke Aquaculture and the Downeast Institute for Marine Research and Education, a laboratory facility with shellfish culture experience. Cooke Aquaculture contracted with the Institute to produce mussel seed as proof of concept for \$4000.

RESULTS: The Downeast Institute successfully produced 15 million mussel seed, which has an estimated commercial value of \$40,000. The volume was enough to seed ten mussel rafts that were deployed around salmon farms in Cobscook Bay, and DEI is further investigating research and development of commercially viable mussel seed production techniques.

RECAP: Maine Sea Grant's involvement in an integrated multitrophic aquaculture (IMTA) project led to production of 15 million juvenile mussels at an estimated value of \$40,000 that were deployed at salmon farms in Cobscook Bay. [Back to Goals](#)

15215 - Maine Sea Grant creates comprehensive guide to local seafood.

RELEVANCE: Consumers of Maine seafood, including year-round residents and seasonal visitors, lacked a resource that contained information about Maine seafood origins, fishery status, health benefits and risks, recreational options, certifications, and markets. Many of the seafood guides produced by national and international non-governmental organizations do not have data on seafood species local to Maine waters, or the information is not specific to fisheries in state waters, resulting in misleading representations of seafood species that consumers might encounter in Maine. With an increasing interest in local foods, and leadership in Maine in seafood sustainability and model market mechanisms such as community supported fisheries, a science-based and comprehensive source of information on unique sea foods of Maine was glaringly absent.

RESPONSE: Maine Sea Grant developed the Maine Seafood Guide (seagrant.umaine.edu/maine-seafood-guide) as a neutral source of science-based information on nearly 40 marine species harvested, sold, marketed, or traditionally consumed as seafood in Maine. The guide collates information on species regulated at federal, state, and local levels as a service to the consumer of Maine seafood. Twenty experts from a variety of organizations, including the National Marine Fisheries Service and the Maine Department of Marine Resources, reviewed the guide.

RESULTS: The guide was published in early 2012 and website statistics indicate that it continues to be one of the most popular resources on the Maine Sea Grant website, and regularly draws inquiries from consumers and the media.

RECAP: Maine Sea Grant created a comprehensive and peer-reviewed online guide to local seafood. [Back to Goals](#)

15210 - Sea Grant research on radioactive fallout from Japan nuclear disaster confirms safety of edible seaweeds.

RELEVANCE: The nuclear disaster following the March 2011 earthquake and tsunami in Japan released radioactive particles, including radioactive iodine, into the global atmosphere. Iodine in the environment is accumulated at high levels by marine macroalgae or seaweed, including seaweeds that are collected in Maine for personal consumption or as part of commercial enterprise. Stimulated by increased demand for their products (because of the thyroid protection offered by iodine and other elements), seaweed companies in Maine wanted to assure their clients that Maine seaweeds were safe for consumption.

RESPONSE: With Sea Grant funding, University of Maine professors Dr. Charles Hess and Dr. Susan Brawley, their students, and staff from Maine Coast Sea Vegetables (approximately \$1 million in annual sales) conducted a rapid assessment of 50 samples of seaweed collected in Maine waters, and found radioactivity to be within background levels.

RESULTS: The confirmed safety of their products allowed Maine Coast Sea Vegetables and additional seaweed companies to increase sales.

RECAP: Maine Sea Grant research supported an assessment that confirmed Maine seaweeds did not contain elevated levels of radioactive iodine as a result of nuclear disaster in Japan. [Back to Goals](#)

15204 - Maine Sea Grant helps create new model to sustain and enhance safety of community fishing jobs.

RELEVANCE: Safety is one of the first aspects of fishing that is compromised as profitability declines in many commercial fishing communities. Meanwhile, citizens of these same communities who have no ties to the industry (an industry that harvests public resources) often have little knowledge about the fishing activities surrounding them.

RESPONSE: In 2009, Maine Sea Grant worked with members of the Midcoast Fishermens Association, The K2 Family Foundation, and community members in St. George, Maine, to develop a new model nonprofit foundation. The Midcoast Maine Fishing Heritage Alliance raises money and disburses funds through a credit-voucher system, hiring fishermen to educate the public about fishing as an industry and as a component of community heritage. Maine Sea Grant continues to work with the foundation to build its capacity and expand its education and research programs.

RESULTS: Since 2010, 18 fishermen have received \$17,000 worth of credit vouchers redeemable at local vendors for life raft inspection or replacement, and for engine or hull repairs. These 18 fishermen

have collectively spent 170 hours conducting outreach at events including the Maine Fishermen's Forum, Common Ground Fair, St. George Days, and several local events organized by the foundation.

RECAP: Maine Sea Grant facilitated creation of the Midcoast Maine Fishing Heritage Alliance, which uses a credit-voucher system to support engagement of fishermen with public education and collaborative scientific research. Since June 2010, the foundation has disbursed \$17,000 to 18 fishermen to help them maintain their boats in a safe and seaworthy condition. [Back to Goals](#)

15202 - Maine Sea Grant helps to create businesses in the aquaculture sector.

RELEVANCE: The United States currently imports more than 80% of its seafood, a trade deficit that represents a market opportunity for American seafood producers. In Maine, commercial fishermen seeking to diversify their businesses have expressed interest in shellfish aquaculture.

RESPONSE: Maine Sea Grant has compiled and produced information on shellfish aquaculture specifically to assist new producers. Sea Grant helps those interested in aquaculture explore their options through field visits, phone and email contact, marketing workshops, meetings, and technical assistance about siting, leasing, and production.

RESULTS: Sea Grant helped two new shellfish growers start a business and begin production in 2011.

RECAP: Maine Sea Grant helped two new shellfish producers begin operations in 2011. [Back to Goals](#)

15200 - Maine Sea Grant helps create National Working Waterfront Network.

RELEVANCE: Water-dependent industries and individuals around the country are faced with declining access to the water, lost business opportunities, and changing character of coastal communities.

RESPONSE: As an outcome of the 2010 Working Waterways and Waterfronts National Symposium on Water Access, which Sea Grant hosted in Portland, Maine, Maine Sea Grant collaborated with partners to form a national network to offer model tools and solutions.

RESULTS: In November 2011, the US Department of Commerce Economic Development Administration entered into a \$533,000 cooperative agreement with Maine Sea Grant and six other partner organizations around the country, igniting the work of National Working Waterfront Network to create and share community and economic development tools for preserving working waterfronts and waterways nationwide.

RECAP: By serving in a leadership role in creating a National Working Waterfront Network, Maine Sea Grant is helping water-dependent industries and individuals around the country gain access to tools and information to enhance and protect waterfront access, water-dependent jobs and businesses, and the character of coastal communities. [Back to Goals](#)

15197 - Maine Sea Grant research results in cost savings, improved efficiency for state lobster assessment program.

RELEVANCE: The American lobster fishery is critical to the Maine economy. Landings have increased steadily since the early 1970s and fishing effort is intense and increasing throughout the range of the species. Quantitative fisheries assessment plays a central role in fisheries management. Current stock assessment methods suggest that the Gulf of Maine stock is overexploited and vulnerable to collapse, yet other studies and field observations suggest otherwise. A total of nine sampling programs form the foundation of lobster stock assessment in Maine. The programs - from port sampling to trap surveys - vary in their history, design, data collected, and costs.

RESPONSE: Dr. Yong Chen of the University of Maine and Carl Wilson, chief lobster biologist with the Maine Department of Marine Resources, compared the different lobster sampling programs to evaluate the effectiveness of current sampling in quantifying the lobster fishery.

RESULTS: Chen and Wilson found that the current design of one sampling program, the bottom trawl survey, performs well in quantifying spatial and temporal variability of lobster in the Gulf of Maine, but redirecting survey efforts according to results from previous years would improve data collection. The research also found weaknesses in the lobster port sampling program, prompting the Department of Marine Resources to discontinue the program and reallocate the estimated \$100,000 in annual savings to more effective lobster sampling efforts.

RECAP: A Maine Sea Grant research project to evaluate the lobster sampling programs in the state identified ways to reallocate data collection efforts, resulting in cost savings and more efficient and effective lobster assessment. [Back to Goals](#)

15191 - Maine Sea Grant research helps fishing communities make ecosystem-based management decisions.

RELEVANCE: A collapse of the lobster fishery would have far-reaching effects beyond the dock, influencing coastal communities and indeed the economy of the entire state of Maine. Lobstermen fishing in waters around Stonington, in partnership with Penobscot East Resource Center, began operating a lobster hatchery to explore the potential for enhancing wild stocks.

RESPONSE: Dr. Richard Wahle received Sea Grant funding to work with the fishermen to determine the success of the hatchery, using diver observations in a before-after-control-impact study design, and genetic fingerprinting analysis.

RESULTS: Wahle was able to distinguish released hatchery-reared lobsters from wild stock, thus documenting successful enhancement. However, given increasing rates of natural settlement in eastern Maine and record landings of wild lobsters, the industry decided to close the hatchery in Stonington in order to focus on bringing back a once-thriving groundfish industry. The estimated \$100,000 needed to run the hatchery can now be reallocated to this effort.

RECAP: Maine Sea Grant research results informed a decision by a local community organization to reallocate resources from lobster population enhancement to groundfish recovery. [Back to Goals](#)

6726 - Maine Sea Grant identifies hazards of the fishing life

RELEVANCE: Fishing is a dangerous occupation, and each year in Maine an average of four fishermen die doing their job. As a result, fishermen are subject to stringent federal and state safety guidelines, but whether or not they comply with current safety standards is unknown. Fishermen, who are largely self-employed, have reasons not to follow guidelines. High levels of unemployment and unpredictable seasonal incomes complicate decisions by fishermen to adopt required safety measures.

RESPONSE: With Sea Grant Research funds, Mary Davis randomly sampled vessels within six commercial fishing regions of the state during routine boardings by the US Coast Guard and the Maine Marine Patrol, collecting data on compliance and associated demographic characteristics.

RESULTS: These results helped improve training and enforcement efforts targeting commercial fishermen in Maine. For example, participants in the Maine Lobster Apprenticeship Program are now required to complete a US Coast Guard Fishing Vessel Safety Drill Conductor course.

RECAP: Maine Sea Grants study of safety and compliance in the Maine commercial fishing industry identified deficits in both safety training and equipment in the Maine inshore fishing industry, and characterized trends in risk perception that can be used to better design outreach and enforcement efforts. [Back to Goals](#)

6724 - Maine Sea Grant supports engagement of fishermen in resource management

RELEVANCE: Entanglement in fishing gear is, along with ship strikes, the dominant source of human-caused injury and mortality for the endangered North Atlantic right whale. Lobster gear has been implicated in a number of entanglement cases, and recent management decisions seek to address the risk of entanglement by requiring the use of sinking ground lines between traps in lobster trap trawls, and weak links in trawl buoy lines, among others, at significant cost to fishermen.

RESPONSE: With Maine Sea Grant research funds provided through Northeast Regional Sea Grant Consortium, the Maine Lobstermen's Association conducted intensive, harbor-by-harbor surveys to document and map how, when and where lobstermen fish on a monthly basis. To date, 38 harbors in Maine have been visited, representing 96% of Maine's harbors; plans are to hold meetings in the remaining harbors in spring 2011 to reach 100% of Maine's harbors.

RESULTS: Data gathered by this effort is being incorporated into a whale entanglement risk model in order to provide regulators and resource managers with scientific data necessary for developing appropriate and effective policies to reduce the risk of endangered whale entanglements in lobster gear.

RECAP: Maine Sea Grant and the Maine Lobstermen's Association are working with fishermen on a collaborative research project for endangered species protection. [Back to Goals](#)

6722 - Maine Sea Grant research identifying fishing community resilience factors and threats

RELEVANCE: Today, Maine's once-diverse fishing culture is concentrated in 50 coastal communities and is overwhelmingly dependent on lobster, while regulations have restricted other fisheries. Since 1990, the number of vessels landing groundfish in Maine dropped from 350 to 70. At least 72 groundfish permits have been lost. Federal fisheries managers must consider impacts on fishing communities when assessing the impact of new rules, yet too often they don't have the data necessary to do so.

RESPONSE: Dr. Teresa Johnson received Sea Grant funds to analyze threats (related to vulnerability) and responses (related to resilience) from preliminary interviews and a review of some basic demographic indicators for three Maine fishing communities.

RESULTS: Johnson has detected a variety of potential response strategies adopted to improve resilience at individual, local, and state levels. Johnson's research raises new questions about the meaning of resilience and vulnerability to different fishermen and different communities, suggesting that (as social scientists often expect) context and history matter. Preliminary research also indicates complex relationships between vulnerability/resilience and gentrification, something Johnson will continue to explore and analyze as the research continues.

RECAP: Maine Sea Grant research identifying fishing community resilience factors and threats

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6717 - Maine Sea Grant keeping fishing heritage alive

RELEVANCE: Since 1980, Maine has lost most of its groundfish fleet. As a result, processing and vessel support infrastructure have also declined. A small number of vessels continue to fish out of Port Clyde, Maine, but new ways and ideas are needed to keep them afloat.

RESPONSE: In an effort to halt and reverse this trend, Maine Sea Grant worked with local fishermen to form the nonprofit Midcoast Maine Fishing Heritage Alliance. The Alliance hires fishermen to conduct research and public education in exchange for credit vouchers to help them maintain their vessels in a safe and seaworthy condition.

RESULTS: In the first six months, the Alliance paid \$3,500 to nine fishermen, helping to retain those jobs and preserving the working fishing community of Port Clyde.

RECAP: Maine Sea Grants extensive networking ability has garnered new income for fishermen through an innovative alliance of fishing heritage interests.

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6693 - Maine Sea Grant builds capacity for community-supported fisheries

RELEVANCE: Modeled after community-supported agriculture, community-supported fisheries are being tried as a new way to enhance profitability and survival of local fishing families while connecting community members to a healthy and sustainable local food system.

RESPONSE: For 10 weeks between January and March, 2010, Sea Grant Program Development funds supported Penobscot East Resource Center's effort to coordinate a Northern shrimp community supported fishery (CSF) with five fishermen in Stonington, Bar Harbor, and Southwest Harbor, and more than 100 customers from towns including Stonington, Blue Hill, Ellsworth, and Bar Harbor.

RESULTS: This project supported the local fishery in several ways. First, it generated more revenue for a portion of the fishermen's catch. Secondly, it placed an emphasis on the development of a local market as a way to diversify the stream of income for fishermen. Third, it fostered connections between local fishermen and local seafood customers, and generated enthusiasm for a fresh, local product. The impetus for starting a shrimp CSF was as a trial run for a future groundfish CSF.

RECAP: Maine Sea Grant supported a community-supported fishery effort that provided fresh, locally-caught shrimp to more than 100 customers in Downeast Maine.

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Program Performance Measures (2010 - 2013)

Program Performance Measure	Program Plan Target (2010-2013)	Reported	Program Comments
Number of coastal communities or watersheds engaged in Sea Grant-funded diadromous species research or outreach.	5	50	2012 - 1 Sedgeunkedunk (see impact 17016). 2 alewife (Perry, Pembroke Extension-Bartlett) 9 Downeast Fisheries Trail sites that emphasize diadromous species (see impact 17059). 2013 - 2 Perry, Pembroke alewife harvesting (18720). 1 Columbia Falls, Downeast Smelt Fry. 9 sites on Downeast Fisheries Trail focus on diadromous species. 1 Penobscot River river herring. 2 Sedgeunkedunk Stream sea lamprey (18694).
Number of strategies and practices to improve operational efficiency implemented in the region + Number of producers that used Sea Grant products and services to achieve sustainability and economic success.	6	1,526	2012 - 1 Practices related to quality and handling of lobster, which began as TAA curriculum (see impact 17058). 1 incorporation of mussel aquaculture at Cooke Aquaculture's salmon farms (see impact 17055). 1 Ocean Approved for kelp resources in Cobscook Bay (see impact 17095). 1 derelict fishing gear recovery project (see impact 17054). + 1 Cooke Aquaculture assisted with source for mussel seed (see impact 17055). 10 individuals engaged in sea scallop production trials. 20 new and existing aquaculture companies received technical assistance. 6 companies engaged in razor clam R & D. 11 sea vegetable/mussel aquaculture companies

		<p>engaged in workshops or research (see impact 17095). 21 Community Supported Fisheries participating in National Summit.</p> <p>2013 - STRATEGIES/PRACTICES: 1 IMTA incorporation of mussel culture at Cooke Aquaculture's salmon farms (R/10-08). 1 strategies to improve handling of lobster, associated with the TAA program (18721). 1 small-scale lobster holding technology and techniques. 1 bulking technology for the sea urchin fishery in Maine (R/12-12). 1 Aquaculture in Shared Waters project (R/12-14). PRODUCERS 5 shellfish companies experimenting with scallop production (18723). 300 lobstermen using improved handling techniques as a result of the TAA (18721). 1 lobsterman using improved holding practices to increase profitability. 2 shellfish farms diversifying into cultured sea vegetables, to be sold in local markets 1 wild-harvest sea vegetable company diversifying into seaweed aquaculture 7 companies receiving sea vegetable lines for cultivation on their farms (18814). 20 recreational alewife harvesters in Pembroke (18720).</p>
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Program Objectives (2010 - 2013)

Program Objective	Achieved (yes/no)	Program Comments
By 2013 three new communities are engaged in Sea Grant-funded diadromous species research.	Yes	<p>2010 - Perry Sedgeunkedunk North Haven DSF</p> <p>2012 - 1 Sedgeunkedunk (see impact 17016). 2 alewife (Perry, Pembroke Extension-Bartlett) 9 Downeast Fisheries Trail sites that emphasize diadromous species (see impact 17059).</p> <p>2013 - Orrington and Brewer, Sedgeunkedunk Stream. Perry and Pembroke, river herring. Penobscot River, river herring. 9 Downeast Fisheries Trail sites that emphasize diadromous species.</p>
Four seafood producers will use practices that will improve quality, profitability, and sustainability as a result of Sea Grant products and services by 2013.	Yes	<p>2012 - 1 Practices related to quality and handling of lobster, which began as TAA curriculum (see impact 17058). 1 incorporation of mussel aquaculture at Cooke Aquaculture's salmon farms (see impact 17055). 1 Ocean Approved for kelp resources in Cobscook Bay (see impact 17095). 1 derelict fishing gear recovery project (see impact 17054).</p> <p>2013 - 2012: 1 Practices related to quality and handling of lobster, which began as TAA curriculum (see impact 17058). 1 incorporation of mussel aquaculture at Cooke Aquaculture's salmon farms (see impact 17055). 1 Ocean Approved for kelp resources in Cobscook Bay (see impact 17095). 1 derelict fishing gear recovery project (see impact 17054). 5 shellfish companies experimenting with scallop production (18723). 2013: 300 lobstermen using improved handling techniques as a result of the TAA (18721). 1 lobsterman using improved holding practices to increase profitability. 2 shellfish farms diversifying into cultured sea vegetables, to be sold in local markets 1 wild-harvest sea vegetable company diversifying into seaweed aquaculture 7 companies receiving sea vegetable lines for cultivation on their farms (18814). 20 recreational alewife harvesters in Pembroke (18720).</p>
One major aquaculture company will implement new approaches to seafood production that benefits from	Yes	<p>2010 - Cooke Aquaculture mussel raft</p> <p>2012 - 1 incorporation of mussel aquaculture at Cooke Aquaculture's salmon farms (see impact 17055).</p> <p>2013 - Incorporation of mussel aquaculture at Cooke Aquaculture's salmon farms (see impact 17055). 2013: 5 shellfish companies experimenting with scallop production (18723). 2 shellfish farms diversifying into cultured sea vegetables, to be</p>

Sea Grant research and extension on integrated multi-trophic aquaculture

sold in local markets
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