A Decade of Discovery:

Collaborative Research in the Gulf of Maine

A report on the 2008 Collaborative Research Visioning Project

Over the course of the Collaborative Research Visioning Project, stakeholders all across the Northeast talked about many more impacts of collaborative research than could possibly fit into these pages. The past decade has shown how much can be achieved by collaboration. Stakeholders are working together, fishing opportunities have opened and data have supported ecosystem management. Simply put, collaborative research is too important to the fisheries of the Gulf of Maine and Georges Bank to be allowed to simply fade away.
Now is the time to build on the critical successes in research that have been achieved and to redouble efforts to promote vibrant and active collaborative research programs within the region.

A Decade of Discovery:

Collaborative Research in the Gulf of Maine

A report on the 2008 Collaborative Research Visioning Project, a study of the merits of funding research collaborations between fishermen and scientists.

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UNHMP-R-SG-08-34

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This publication was supported by the Northeast Consortium and by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration under NOAA grants NA06NMF4720095 and NA060AR4170109 respectively. The views expressed herein do not necessarily reflect the views of any of those organizations.

The Collaborative Research Visioning Project and this report on collaborative research would not have been possible without the support and contributions of many individuals and organizations.

Project Funding: Northeast Consortium, New Hampshire Sea Grant College Program

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Cover Background Image: National Aeronautics and Space Administration

Data Analysis: Ken La Valley

Pie Chart Design: Susan Chalifoux (NHSG)

Gulf of Maine Map (page 4): Map composition, Shane Bradt (UNH Cooperative Extension); bathymetry data, Massachusetts Office of Geographic and Environmental Information

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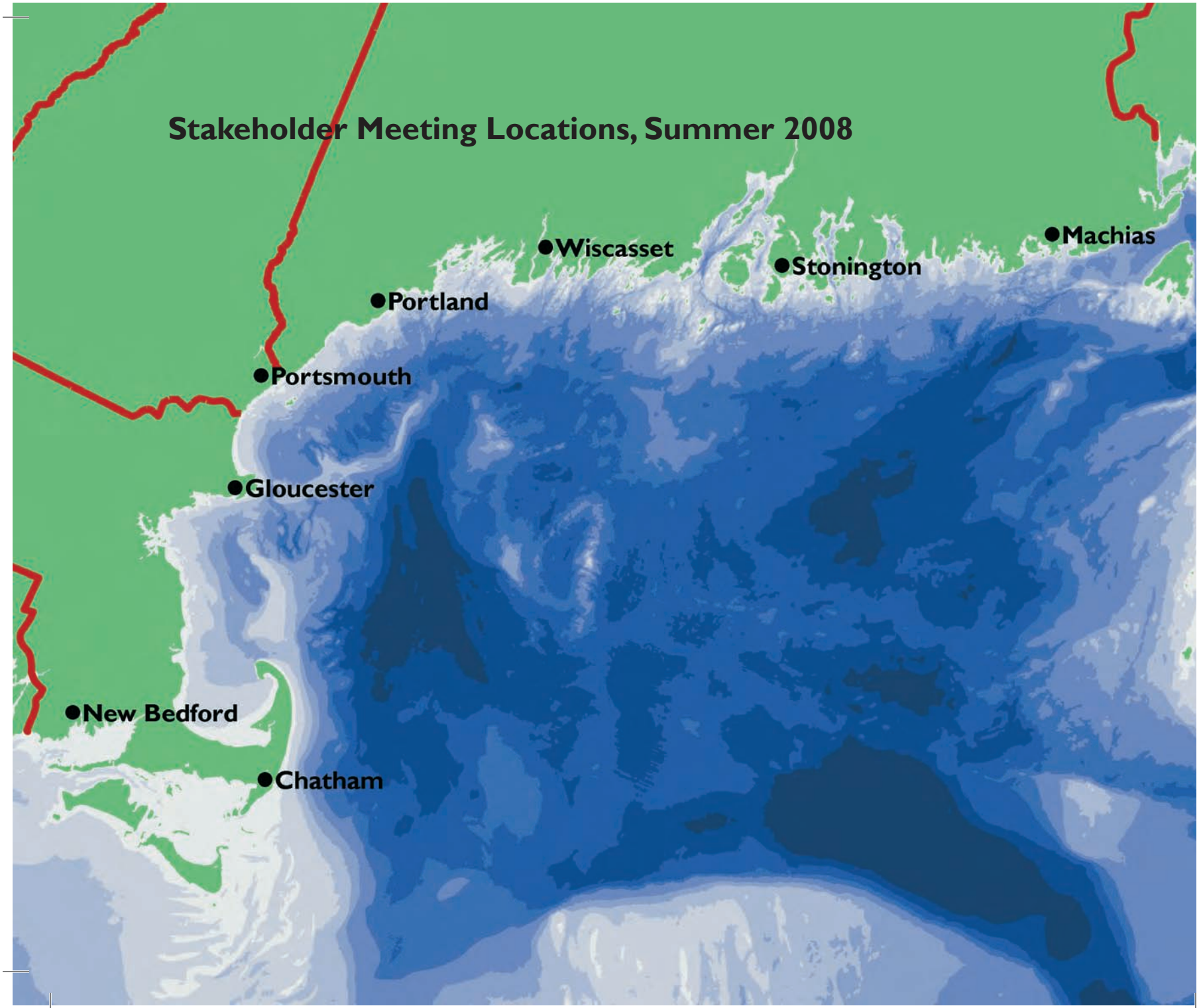

Stakeholder Meeting Locations, Summer 2008
Wiscasset
Machias
Stonington
Portland
Portsmouth
Gloucester
New Bedford
Chatham

Executive Summary

The past decade has seen a significant investment in collaborative fisheries research, within the Gulf of Maine and Georges Bank ecosystems, to increase data collection and to improve relationships amongst and between marine fisheries stakeholders.

Two programs critical to building capacity for collaborative research in the region are the Northeast Consortium, based at the University of New Hampshire, and the Northeast Cooperative Research Partners Program, based at the Northeast Fisheries Science Center. Since 2000, more than 250 research projects have been funded, partnering more than a thousand stakeholders. These projects have included studies of fish biology, populations and ecosystem processes, as well as stock assessments, fishing gear conservation engineering, socioeconomic impact assessments, and outreach and education endeavors.

While many agree that industry-science collaboration has been beneficial, the extent to which collaboration has impacted regional fishery stakeholders intellectually, socially, economically and in management policy has not been documented.

To that end, New Hampshire Sea Grant and the Northeast Consortium have partnered to facilitate the Collaborative Research Visioning Project. Informal, public discussions were held in eight communities in the summer of 2008 from Machias, Maine, to New Bedford, Mass. Stakeholder input was also sought through a survey. In total, 165 people attended the meetings and over 60 surveys were returned.

This project looks back at the collaborative research in the Gulf of Maine and Georges Bank and allows the individual coastal communities that surround it to give their input on how the investment in collaborative research has impacted fisheries research and management capacity, economic opportunities for fishermen, and communication within the region. Input was solicited on how the results could and should be utilized, and critical lessons have been learned to evolve more effective collaborative research funding programs in the future.

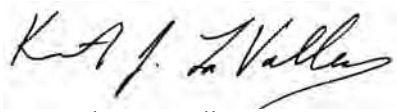
The clear message throughout is that the impact of collaborative research has been great and a future loss of research opportunities would be significant. Several common themes emerged. An increase in the ability to conduct research was a frequently cited impact. Partnerships have moved beyond just boat-for-hire service, representing true sharing of ideas at all project stages. Collaboration has improved relationships, trust and communication between science and industry and between fisheries and fleet sectors.

These changes would not have occurred without the sharing of knowledge and values that results from groups working together. Building an understanding and appreciation for both the rigors of science and the experience of industry may be the foundation that has fueled trust between science and fishermen. Many partnerships have been maintained beyond the scope of any individual project. In addition to the social impacts, economic benefits included enhanced gear efficiency, new fishery opportunities, and help to sustain fishing operations.

Most participants felt that a loss of funding in the future would significantly limit research capacity and the capability for science and management to address local, emerging or regulatory priorities. Less funding would result in fewer science and industry members participating, the outcome of which may be fewer opportunities for stakeholders to work together, build trust and network.

This report captures the voices of individual people, in their communities, on how collaboration is making a difference.

Rachel Gallant Feeney
Northeast Consortium



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Introduction

A Decade of Collaboration

Collaborative fisheries research in the Gulf of Maine and Georges Bank is not new. Fishermen and scientists have been working together since the 1800s. But by the late 1990s, the New England fishing industry, science and management communities were engulfed by the groundfish crisis and the divisions among stakeholders were growing larger and larger. This spawned several programs that brought industry and science to the problem-solving table in ways that had previously been impossible.

Collaborative Fisheries Research

Fishermen and scientists working together as equal partners, each using their unique knowledge and expertise to better understand the marine environment, fisheries, marine communities and fish capture systems, and to promote effective and equal use of marine resources for all.

Commercial fishermen, scientists, students, industry associations, businesses, universities and agencies from Eastport, Maine, to New Bedford, Mass., and beyond have participated in and benefited from this work. But perhaps most importantly, collaborative research has helped bring fishermen's information, first-hand experience and expertise into the scientific framework needed for effective management of our marine resources.

Now in 2008, collaborative research is at a crossroads. The past decade has shown how much can be achieved by collaboration, but federal funding has all but dried up in recent years. Now is the time to build on investments that have already been made, to build on the critical successes in research and to redouble efforts to promote vibrant and active collaborative research programs within the region. After all, other regions and indeed other parts of the world have been looking at the initiatives in the Northeast region as a template for similar ventures elsewhere.

Assessing the Impact of Collaboration

It is the voice of stakeholders that is most needed to continue the great gains that collaboration has made in our region. With a bank of research projects and partnerships built, it is time to take stock of the cumulative impacts of collaborative research and to consider what the future holds. So over the summer of 2008, the Northeast Consortium and N.H. Sea Grant embarked on the "Collaborative Research Visioning Project."

A series of eight public meetings, between July 28 and August 7, were held in communities surrounding the Gulf of Maine from Machias, Maine, to New Bedford, Mass., to glean from fishermen, scientists and others how collaboration has impacted them, their communities and the management of marine resources that are important to them. An independent facilitator led each two-hour discussion, which focused on the following key questions:

- How has collaborative research impacted your personal, business, organizational, research or management capacity?
- How has collaborative research affected communication among scientists, fishermen and other stakeholders?
- How have collaborative research results been used? Can we improve the dissemination, integration and use of collaborative research information?
- What should the future of collaborative research be? What would result if funding faded away?

Simultaneous to the meetings, a survey was mailed to over 1500 fishermen, scientists, fishery managers, non-governmental staff and politicians in the focus region and beyond to capture the perspectives of those who could not attend the meetings. In total, 165 people attended the meetings and 60 surveys were returned.

Data Analysis

Data were compiled by region from the stakeholder meetings and survey responses, not only about the impacts of specific collaborative research projects, but on individual perceptions of the benefits of collaborative research and the impacts that may result from a loss of collaborative research funding.

Perceived Benef ts of Collaborative Research

Enhanced Communication — among and between fishermen, industry organizations, scientists, fishery managers and others.
Research Capacity — increased opportunities to do research by leveraging industry vessels and fishermen's knowledge and/or expertise.
Trust Building — value sharing, acceptance by regulators or scientists of data gathered by fishermen, and industry support of research outcomes.
Relationship Building — development of industry associations, partnerships maintained beyond the scope of a specific collaborative project, and improved collaboration among stakeholders.
Economic Value — enhanced gear efficiency, new fisheries, increased fishing opportunities, and collaborative research dollars used to help sustain fishing operations.
No Direct Benefits — regional research capacity, stakeholder partnerships, and economies do not benefit from collaborative research.

Perceived Impacts of Collaborative Research Funding Loss

Loss of Research Capacity — decreased ability to study important ecosystem questions, fewer fishermen able to contribute their vessels, knowledge and expertise for scientific research.
Loss of Partnerships — fewer opportunities for stakeholders to work together, build trust and network.
Loss of Economic Assistance — fishermen would no longer be compensated for participating in research.
No Direct Impact — regional research capacity, stakeholder partnerships, and economies would not experience significant change.

Collaborative Research Funding Programs

Collaborative fisheries research in the Northeast has existed since the 1800s, but only in the last decade have formal, federally funded programs been implemented, both within and external to NOAA Fisheries.

The Northeast Consortium

The Northeast Consortium (NEC) was created in 1999 to encourage and fund collaborative research and monitoring projects within the Gulf of Maine and Georges Bank. These projects involve effective, equal partnerships among fishermen, scientists and other stakeholders. The University of New Hampshire (UNH), the University of Maine, the Massachusetts Institute of Technology, and the Woods Hole Oceanographic Institution work together to foster this program. Awards from NOAA Fisheries are administered by UNH on behalf of the NEC.

Funds are distributed via open competitions for research that must involve partnerships between commercial fishermen and scientists. Projects are selected based on several criteria, including importance for coastal ocean and fisheries management, likelihood of success and potential impact. A 25-member advisory committee provides programmatic advice to assist in the selection of projects to be funded. Topics generally funded include fishing gear technology; stock assessments; fish biology, habitats and ecosystems; and fisheries socioeconomics, outreach and education.

Since its founding, the NEC has administered about $32M, funding 181 collaborative research and project development awards involving over 499 commercial fishing vessel owners and captains (and a nearly equal number of crew members), 45 industry organizations or shore-side businesses, and 214 scientists and 107 students and interns from 65 research institutions or agencies. The majority of the research participants have been from states surrounding the Gulf of Maine (95% of fishermen and 85% of scientists and students).

Northeast Cooperative Research Partners Program

The Northeast Regional Office and the Northeast Fisheries Science Center of NOAA Fisheries developed the Northeast Cooperative Research Partners Program (NCRPP) in 1999 to formalize and expand cooperative research among New England's commercial fishing industry, marine science and fishery management communities. The goal is to enhance the data upon which fishery management decisions are made, as well as to facilitate communication and cooperation.

Two avenues of cooperative research have been developed, and over $23M dollars have been administered to date by NCRPP. First, three long-term programs were implemented: an industry-based survey to collect fishery-independent information, a Study Fleet to collect fishery-dependent information in higher resolution, and the Atlantic Cod Tagging Program to study movements and aggregation patterns. The other avenue of funding is short-term research projects (one-two years duration) on topics such as habitats, marine mammals, gear technology and socioeconomics. Topical workshops, safety trainings and socioeconomic surveys have also been funded.

Over 71 short-term projects have been funded on research priorities that are identified with the input of the New

England Fishery Management Council. In those with final reports submitted, 206 commercial fishing vessel owners and captains, 181 scientists and nine students, and 58 industry or science organizations have participated in the research. Most of the research participants have been from states surrounding the Gulf of Maine (90% of fishermen and 91% of scientists and students).

The Saltonstall-Kennedy Grant Program

The Saltonstall-Kennedy Act (S-K), as amended (15 U.S.C. 713c-3), established a fund for NOAA Fisheries to provide grants or cooperative agreements for fisheries research and development projects that benefit U.S. marine and Great Lakes fisheries. Funds for projects, which were first appropriated in FY1954, are distributed each year (subject to funding) through a nation-wide competition. In recent years, funding topic areas have included aquaculture, fisheries bycatch, fisheries utilization, habitat protection, management alternatives and fisheries user conflicts, marine recreational fisheries, and product quality and safety. Since the mid-1980s, a minimum non-federal 10% cost share based on total project costs has been required of proposals.

Research-Set-Aside Programs

Research-Set-Aside programs (RSAs) were developed by the New England Fishery Management Council (NEFMC), the Mid-Atlantic Fishery Management Council, and the Atlantic States Marine Fisheries Commission through fishery management plan processes. Some fisheries set aside a portion of the annual fishery-wide allocation (no more than 3%) to be harvested for the purpose of funding research. RSAs are administered by the NOAA Fisheries NCRPP. In New England, RSA programs have been implemented for Atlantic sea scallops (since 2000), monkfish (since 2006) and Atlantic herring (since 2008). In the mid-Atlantic, RSA programs are focused on summer flounder, scup, black sea bass, Atlantic mackerel, squid, butterfish, bluefish and tilefish (since 2001).

RSA programs promote collaborative research among fisheries participants, marine scientists and fishery managers to further the understanding of our nation's fisheries and enhance information used in fisheries management decision-making. Over $28M has been used to fund over 60 RSA projects to date. Of the 40 projects with final reports submitted, about 85 fishermen, five non-governmental organizations, 46 scientists and five graduate students have participated in the research. The majority of the participants have been from states surrounding the Gulf of Maine (53% of fishermen and 51% of scientists and students). Projects have ranged in size from $40K to $2.6M.

Additional Programs

A number of other initiatives have provided funding for marine fisheries research in which regional fishermen and scientists have gotten involved, though the partnerships may or may not have been a funding requirement. Federal, state, town and non-governmental organization funding has been utilized. Example programs include the Large Pelagics Research Center at UNH, state marine resource agencies, the Island Institute, the National Science Foundation and the Economic Development Administration.

Downeast Maine: ***Eastport to Acadia***

The lobster industry is the predominant employer in Beals Island, Maine.

Fishing is one of the few industries that sustain coastal economies east of Acadia. Today, fishing occurs almost exclusively in state waters. Although the extreme tides and currents limit some nearshore fisheries, urchins, scallops, clams, lobster and finfish are the targeted species. Smaller fisheries for sea cucumbers, ocean quahogs, alewives, elvers and periwinkles provide some seasonal flexibility for the industry. Downeast has the highest presence of aquaculture in New England, although it has declined in recent years.

Since 2000, collaborations have involved more than 28 fishermen from the region and their crews. There are a handful of marine scientists and students located in the region, primarily at the University of Maine at Machias. At least eight local scientists and students and at least 21 from outside the region (e.g., the Maine Department of Marine Resources, the Gulf of Maine Research Institute, the Lobster Institute) are partnering with local fishermen in collaborative research funded by the NEC or other sources. Since few fishermen (except lobstermen) from this region fish in federal waters, it is unlikely that many have participated in NOAA's Cooperative Research Partners Program.

The Visioning Meeting, held July 29 in Machias, drew 15 stakeholders: university scientists, fishermen, cooperative extension staff and a fiscal manager of research programs.

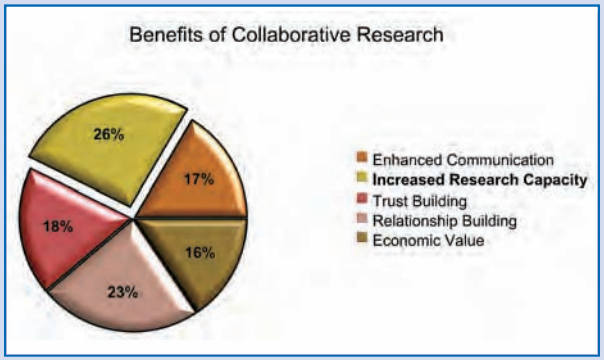
Stakeholder Perspectives

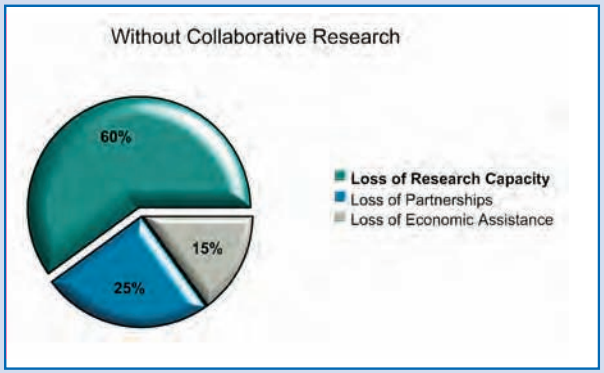
Science Impacts

- "I am able to see what fishermen see, and **they see the necessary scientific rigor**. There are several different right ways to reach project goals, and it's helpful to have everyone's input." – *scientist*
- With funding from lobster license fees, stakeholders are studying lobster growth and aging at sites from York to Cutler, a research priority identified by Maine DMR.
- In the past year, lobstermen in Southwest Harbor were observing shell disease in crabs. They are now working with the University of Maine to monitor the situation.
- The study of scallop enhancement techniques is helping stakeholders learn the conditions needed for successful spawning.
- The Lobster Institute, based at the University of Maine at Orono, was founded in 1987 by the initiative of industry. Its work, from New York to Newfoundland, has all been collaborative.
- "When good projects happen and news makes it into the press, it improves the public's perception of fishermen. **We are not pirates.**" – *fisherman*
- "Fishermen are the best eyes and ears to what is happening." – *scientist*
- "**The fishermen help guide me to potential health problems** they see. We are preventing disasters." – *extension scientist*
- "Some fishermen think that the less information science knows the better. Well, it's usually worse **when scientists try to figure things out on their own**." – *fisherman*
- "When doing diagnostic work, **we don't have to reinvent the wheel** when we collaborate with fishermen. The funding we get from lobster pound people to start looking at a problem helps to get a larger chunk of funds from a granting institute." – *fish pathologist*

Impact Assessment

After compiling survey responses as well as comments made during the Visioning meeting, stakeholder views were summarized for the region. Increased research capacity through collaboration with science and industry was not only most cited as a benefit, but the loss of research capacity was the most cited impact from a potential loss of funding. Collaborative research funding has increased the research capacity of the Downeast region by supporting a broad base of projects and topics between fishermen, scientists and regulators. These opportunities have led to enhanced relationships and trust building among stakeholders.





Ocean Quahog Fishery Sustained

Taken during a two-minute tow in the quahog beds south of Great Wass Island, this sample of quahogs is very uniform in size and free of bycatch.

Collaborative research has helped the ocean quahog fishery in Downeast Maine remain a viable option for fishermen. Managed by the Mid-Atlantic Fishery Management Council, the ocean quahog is harvested from Newfoundland to Cape Hatteras. Although the resource in Maine constitutes less than 2% of the total harvest, at a value of about $3.2 million per year it is a significant part of the regional economy.

Catch rates in the Maine fishery were relatively stable for years, but in the 1990s emerging markets resulted in increased fishing pressure. In 1998, the Maine fishery was fully integrated into the more extensive surf clam/ocean quahog federal management plan, with approval of Amendment 10. A quota was set for Maine at 100,000 bushels per year, but this decision was based only on historical trends in landings. A stock assessment had never been conducted for the Maine resource.

Many of Maine's 30-50 quahog harvesters believed that the fishery would be sustainable with the newly imposed catch limit, but there was concern that the quota would inevitably be reduced without more scientific information about the health of the resource. Partnering with the Maine Department of Marine Resources, Capt. Kristan Porter of Cutler received Northeast Consortium funding in 2001 to begin a pilot survey of quahog beds and to study the efficiency of the dredge used in the survey.

"Our study provided the justification for keeping our quota," said Porter. "The fishery might have been shut down otherwise." Collaborative research has continued on the quahog, involving surveys of the stock every other year and research on dredge efficiency. It is funded from a tax dealers pay on each bushel of quahogs that they purchase. The data was used in conjunction with NOAA Fisheries data in a 2005 cooperative assessment of the status of ocean quahogs, giving Maine an active role in the management of this stock.

Management Impacts

- "We **overcame managers' suspicions** of fishermen's data by demonstrating with side-by-side studies that their data is as good as ours." – *scientist*
- In the late 1990s, the Jessie B. Cox Charitable Trust funded community-wide clam enhancement projects. The Downeast Institute partnered with Georgetown, Wiscasset and Edmonds, communities that showed great interest in participating and involving local students and townspeople. Today, these towns are still actively engaged in shellfish management.
- Following that project, when clams were getting scarce in Molly Cove of Great Wass Island, the clam diggers, scientists and town residents agreed to close, reseed and monitor some areas for two years, with funding from the National Science Foundation. Productivity rebounded and the industry of 20-30 diggers has been sustained.
- The Economic Development Administration recently funded demonstration clam farms in Edmonds, Trescott and Lubec, where fishermen were given opportunities to learn how to manage the harvest of clam flats.
- "Urchin divers accepted the first limit in the mesh size of their collection bags based on a small collaborative project with the state to study bycatch and escapement from the bags. **Before the research, there was no regulation.**" – *state manager*
- Near Bar Harbor, mussel draggers,

scientists, students, a water quality coalition and the town conducted the largest eel grass bed restoration project in Maine to preserve clam flats. The draggermen helped decide which areas would be closed to them." – *research facilitator*

- "Urchin drags are now required to have an escape panel to reduce bycatch. This idea came from the industry as a conservation measure, but there was no data. A Northeast Consortium-funded project help determine that the panels do lower bycatch and that an alternate configuration to the one most frequently used by industry was best." – *state manager*
- A project to monitor and enhance scallop beds involved one of the first scallop closures in the region. Before the NEC-funded project, scallopers were largely against closures, but now more **see the value of closures**. The Scallop Advisory Council is getting a lot more active in management.
- "In 1999, scallop harvesters and scientists traveled to Japan to learn enhancement techniques. Collaborative research is helping change people's thought; more are willing to make **an investment in the bigger picture**." – *fisherman*
- "Collaborative research leads to collaborative management." – *extension staffer*
- "Research is giving us a bit more hope for the future." – *fisherman*
- An early collaborative project between a lobsterman and University of Maine faculty and students demonstrated the contribution that V-notched lobsters make to the fishery. As a result, V-notching became part of the federal management plan.
- The first ever survey of sea cucumbers in Maine, collecting biological and ecological information and evaluating fishery impacts on resources, was conducted. The data from this NEC-funded survey has played a critical role in the management plan for the sea cucumber fishery in the state.

Scientist Andrew Gowen records scallop dredge efficiency data electronically.

Partnerships

- "I've worked with a scientist for 17 years, and there is no one more **dedicated to the ecology of this area**." – *fisherman*
- "Sometimes the result of a project isn't what we hoped, but the relationships that we built with the people involved lead us to improved work next time." – *extension staffer*
- "**Research bridges a gap between science and industry.** I now have scientists that I can call when I have a question. Years ago, we turned our backs to each other." – *fisherman*
- "Because I've done some science, I'm more aware of what is good science and also when the wool is getting pulled over my eyes." – *fisherman*
- "I've seen first-hand how long it takes for scallops to grow. I'm much more conservation minded now. **I feel more like a stakeholder now.**" – *fisherman*

Importance of Research Funding

- "If collaborative research funding stopped, there would be less research going on. People just can't afford to do all the necessary work as a favor. There is only so much that folks can give." – *extension staffer*
- "Without continued funding, we wouldn't get to know any new scientists, just the ones we had worked with in the past." – *fisherman*
- "By human nature, if you are getting paid, you tend to be more dependable, which really helps the science." – *research coordinator*
- "We would take **a big step backwards** if support for collaboration fades away." – *scientist*
- **"The bigger questions only get answered with research dollars."** – *extension staffer*

New Ideas/Improvements

- "We need more collaboration through time, not just snapshot approaches. Spatial and temporal examinations are more compelling for decision making." – *extension staffer*
- **"The more collaborative management is, the better.** But there is

"Now I might not agree with a management decision, but at least I know how they got to where they got." – fisherman

Experimental Halibut Fishery Provides Scientific and Economic Opportunities

Jason Alley, owner and captain of the **F/V Aspiration,** *prepares to release a tagged halibut.*

Considered a nuisance species in the Gulf of Maine during colonial times, the halibut stock had collapsed by the 1940s and was considered "commercially extinct." Downeast Maine had a longstanding spring tub trawl fishery for halibut. The fishery would fill in the time between the end of winter fishing for scallops and the start of the lobster season. Currently, Atlantic halibut catches in federally regulated U.S. waters are limited to bycatch levels (one fish per trip) incidental to the targeted groundfish fishery. The collapse of the groundfish fishery and reduction in fishing effort has all but eliminated the trawl fishery in Maine as well as any information provided by the incidental catch of halibut.

The region has been left with the question: "Do Atlantic halibut still reside in federal waters?" Commercial fisherman Robert Alley of Beals recalls going to the Maine Department of Marine Resources. "We said we would like to show that there are Atlantic halibut in federal waters. We know they are there and we can't fish because we lost our right to get to them." The effort to collect data on halibut, including distribution, relative abundance, migration, and stock definition and size, started in the year 2000. Over the past eight years, the effort has been a collaborative project involving Maine DMR, Maine Sea Grant and Downeast fishermen. Each year as many as six fishermen have been issued permits by NOAA Fisheries to fish for Atlantic halibut, using baited hook trawls, in an area along the eastern coast of Maine. Fishermen participating in tag and release projects maintain detailed logbooks, which continue to provide significant information about the resource. As part of the experimental fishery, fishermen are allowed to retain fish that meet the federal minimum size regulation of 36" up to a total allowable catch. Chris Bartlett of Maine Sea Grant points out that "The project didn't result in the opening of a fishery in federal waters, which the industry may have wanted up front. But what it did do was get Maine DMR thinking about the resource and the development of a state water experimental fishery."

In addition to the economic opportunity for local fishermen, the experimental fishery has provided initial insights into the movement patterns of Atlantic halibut between U.S. and Canadian waters. In a 2007 ***Journal of Northwest Atlantic Fisheries Science*** article, researcher Khol Kanwit says of the Atlantic halibut tagging program, "Without the cooperation of the fishing industry, Maine Sea Grant, Maine DMR and the NMFS Northeast Regional Office, this work would have been impossible."

still a bit of a top-down approach, especially when you get to the federal level." – *extension staffer*

- "There's a big difference between collaboration and cooperation. **We need fishermen's ideas, not just their boats.** I want more funders focused on the collaborative process." – *extension staffer*

Penobscot Region: ***Acadia to Rockland***

The majority of towns from Acadia to Rockland have active commercial fishing ports, and the economy is largely dependent on marine industries. Rockland remains the largest port in the region, in terms of value and pounds landed, and is the center of processing and shipping activity. With downturns in groundfish abundance and increased restrictions, the region's fishermen rely almost exclusively on lobster. Minor fisheries include scallop, shrimp, urchin and herring. Market prices limit the crab fishery.

Since 2000, collaborative research has involved over 45 fishermen and their crews and six industry organizations or businesses (e.g., Downeast Lobstermen's Association, Stonington Fisheries Alliance). The Island Institute, located in Rockland, is one of the few organizations in the region that has scientific staff partnering with fishermen. At least 28 scientists and students from outside the region (e.g., the Maine Department of Marine Resources, the University of Maine, Maine Sea Grant, the Gulf of Maine Research Institute, Southern Maine Community College, NOAA Fisheries, Rutgers University) are partnering with local fishermen.

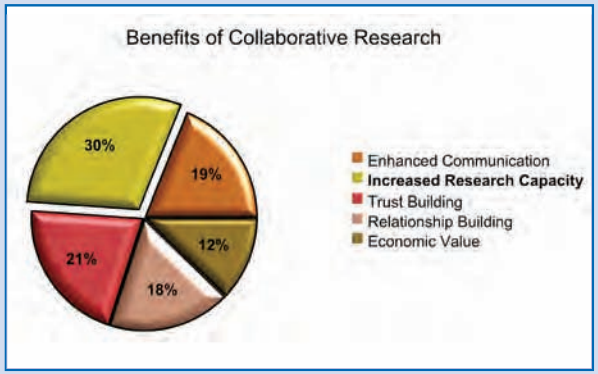
The Visioning Meeting, held July 28 in Stonington, drew a mix of 15 collaborators: fishermen, graduate students, industry association staff, aquaculturalists, collaborative research facilitators, state scientists, fish distributors and community program board members.

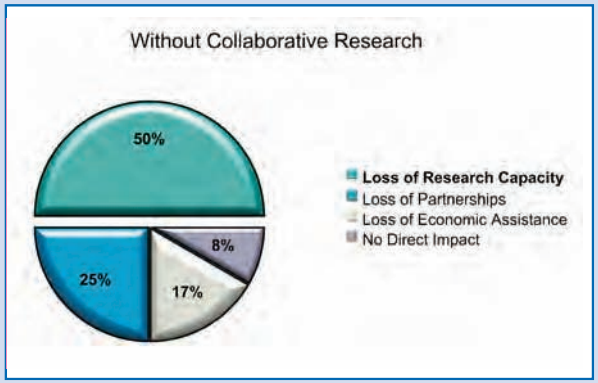
The coastal community of Stonington, Maine, is largely dependent on summer tourism and the lobster industry.

Stakeholder Perspectives

Science Impacts

- The Maine Department of Marine Resources conducts a lobster sea sampling program with 21 trips a month on volunteer lobster vessels to collect biological information on catch and bycatch. The lobstermen involved receive a report of the data collected from their vessel, and the entire dataset is used in the stock assessment process.
- "I do the lobster ventless trap survey, and **my phone rings all night long** with guys wanting to know what we are seeing. A lot of lobstermen are interested in the data. The information is constantly used. Having more vents in traps can only help us." – *lobsterman*
- When lobstermen were interested in developing a Jonah crab fishery, they approached the state with their ideas. Funded by NEC, the team successfully designed a Jonah crab trap to eliminate lobster bycatch, conducted the first stock assessment for the species, and assessed the potential for a targeted Jonah crab fishery in Maine waters. Current market conditions have not yet opened a window for this fishery.
- In the mid 1990s, when cod stocks collapsed, NOAA Fisheries determined that cod are spawning in very limited areas, primarily in the western Gulf of Maine. Since then, collaborative research has expanded the amount of data available to make estimates of spawning locations and demonstrated that spawning occurs more widely.
- The fishermen-led creation of a lobster hatchery has triggered many **scientists to look at Stonington as a place to come to do research** on larvae movements, local production and health issues.
- Maine Sea Grant and local scallopers partnered to improve scallop spat collection techniques and do enhancement projects, starting in 2001. That NEC-funded project has since ended, but several partners continue to collaborate on enhancement.
- The Maine Scallop Research Fund sponsored an international scallop enhancement workshop in February 2005 in Ellsworth, Maine, to lay the foundation for next steps in scallop





Impact Assessment

A common theme expressed by the rural lobster communities of Maine has been the enhanced capability for fisheries questions to be addressed by leveraging the infrastructure and expertise of commercial fishermen with the evaluative skills of scientists. This was no different for the Penobscot Bay region, which most frequently cited enhanced research capacity as a benefit of collaborative research. Coinciding with this increased capacity was the perception that a loss of funding for collaborative research would directly impact the ability for science and industry to address a broad range of fisheries questions.

eMOLT: Building Research Capacity Through Collaboration

eMOLT, or Environmental Monitors on Lobster Traps, is a non-profit collaboration of industry, science and academics devoted to monitoring the physical environment of the Gulf of Maine and the Southern New England Shelf. "It all started with an ocean observing project on Georges Bank in the 90s," explains Jim Manning, a National Marine Fisheries Service scientist who directs the eMOLT effort.

Manning was working with U.S. Global Ocean Ecosystems Dynamics, a component of the U.S. Global Change Research Program, to collect oceanographic data to assist scientists with understanding and ultimately predicting how populations of marine animal species respond to natural and anthropogenic changes in global climate. "Lots of money was being spent across multiple ships, moorings and infrastructure," remarks Manning. Each night he could see a half dozen boats on the horizon and wondered if the fleet would be interested in helping with data collection. In 1995, Manning began speaking with the offshore guys in Sandwich, Mass. Before he knew it, he was deploying probes on the offshore fleet.

Manning's initial observations in the night skies of the Gulf of Maine have led to more than 10 years of industry collaboration and the eMOLT project. By deploying low-cost monitoring probes, he has found himself working with more than 100 commercial lobstermen on the project, collecting oceanographic data throughout the Gulf of Maine. Manning admits that "the research and data collection capacity we have through eMOLT would not be possible without industry collaboration."

The eMOLT partners currently include all the major inshore and offshore lobstermen associations in New England, a NOAA scientist, the Gulf of Maine Lobster Foundation, and the Marine Science Department at Southern Maine Community College. The eMOLT database consists of more than 1.8 million hourly records of temperature, 80 thousand hourly records of salinity, and 40 thousand satellite drifter fixes. While their mission is primarily motivated by lobster science and the need to document background conditions, the eMOLT database is accessible to the general public and by the recently formed Gulf of Maine Ocean Data Partnership.

Capt. Steve Robbins prepares eMOLT surface drifters.

enhancement along the Maine coast.

● What was once productive lobster habitat in upper Penobscot Bay began to be severely impacted by pollution when a chemical plant was built in the upper reaches of the bay. The plant has since been closed and declared a "Superfund Site." In order to reclaim the bay as viable fishing grounds, collaborative research is helping identify specific locations where fishing declined and where nursery habitats

● *"Collaborative research gives validity to what would be anecdotal information otherwise." – anthropologist*

● *"Research is very expensive. With today's economic realities, it is very hard for fishermen to work pro bono." – research coordinator*

were lost, as well as restocking areas with lobster.

Management Impacts

● "The first time I landed groundfish after management increased the cod end mesh size to 6.5 inches, I saw no juveniles in the catch. I'll give you that for **a benefit of collaborative research**." – *retired fisherman*

● "Difficulty comes when science comes up with a conclusion and throws it at the industry and there is no common ground. If fishermen are part of the solution, contributing their time and knowledge, you get **a whole different dynamic**." – *fisherman*

● A trap density study that Monhegan lobstermen did in partnership with the state showed that a cutback in the number of traps in a given area does not necessarily translate to lower catch, and the lobstermen there have changed how they manage the fishery based on the NEC-funded project. Communities along the coast are looking at the results of that project to see if their costs can be lowered (fewer traps) while sustaining catch levels.

● "Having industry participants is helpful. They are able to **share the project with their fishing communities in an understandable way**." – *scientist*

Partnership Impacts

● "Doing research is my way of giving back to the fishery." – *lobsterman*

● "We have backed out of proposals at times because a scientist didn't understand the importance of working with industry in every phase of the project." – *research facilitator*

● Collaborative research has not necessarily built industry leaders, but it has engaged leaders, tapping into networks that already existed.

● "Fishermen learn about **the snail's pace of science**. The Penobscot East Resource Center exists to help share worlds." – *research facilitator*

● Relationships built depend on the people involved. People will tend to collaborate again in the future if the first experience was positive.

● There is give and take in collaboration. One needs to be open and willing to change.

Importance of Research Funding

● A lobsterman noted that it would be illegal for him to study bycatch on his own, to set ventless traps. Both the research funding and permit are necessary for him to participate.

● "It's a really bad time to be asking fishermen to volunteer their boats, fuel, gear and labor to participate in research. We call 30 to 60 people in order to get a boat for a day." – *research facilitator*

● "I worked on scallop spat collection and enhancement several years ago. I didn't receive any money, I just wanted to do it for my own career." – *scallop diver*

Capt. Joseph Chalmers developed a trap for sublegal lobster assessments.

New Ideas/Improvements

● Local fishermen would like to participate in groundfish research, but the logistics and permissions are more difficult when one does not have a commercial groundfish permit or fishery allocation.

● "There need to be more validations of fishermen's voices. For example, people are seeing a lot more life in the water with recent changes in the Area 1A herring fishery, but others in science or management say that isn't possible. **It is important to iron out differences.**" – *community member*

● The region now relies on state fisheries almost exclusively, except for lobster. It was felt that there needs to be more funding available to address issues important to state fisheries and emerging fisheries.

● "We might go back to 'ivory tower' science if collaboration stops." – *industry organization staffer*

Lobster Hatchery Fosters Community Science

From its beginnings in 2006, the lobster hatchery in Stonington has been inspired, built and led by fishermen, with the aim to hatch and rear juvenile lobsters and release them to the wild. Many lobstermen feel that hatcheries could be critical in the future if lobstering takes a downturn. The 10 towns in Maine Lobster Management Zone C have all contributed resources to the project, and many lobstermen donate their time to help ensure its success.

Although the science world has been slower to make the hatchery a priority, its unique design and the knowledge of the fishermen involved are creating opportunities for new scientific research. Monitoring the survival of the lobsters has been very important to the effort and is not an easy task since the lobsters are too small to be tagged when released. Funding from the Northeast Consortium and other sources helped the Penobscot East Resource Center, which has been fostering the hatchery's collaborative research, host a two-day workshop in April 2006 of Zone C fishermen and scientists from Maine and Canada to develop a strategy to measure the hatchery's success.

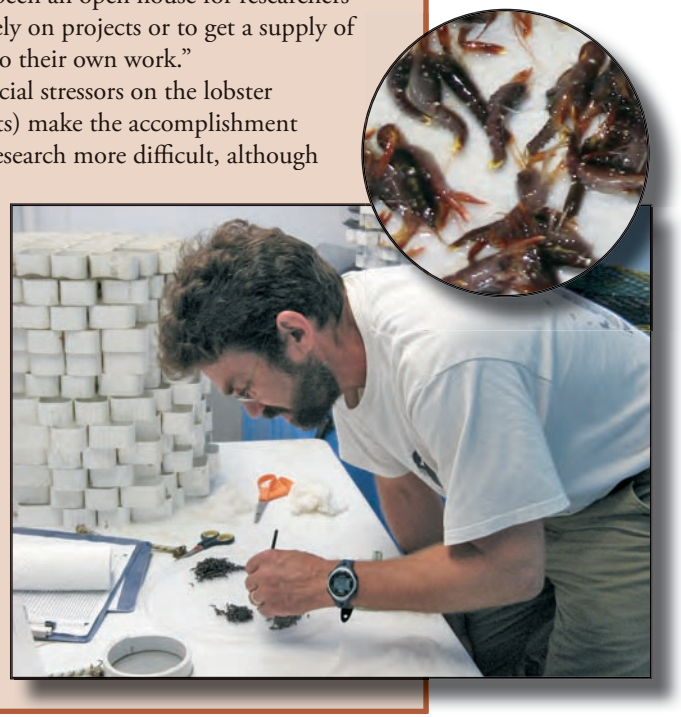
The workshop was a significant step in developing plans for research, such as before-after studies at release sites and using genetics to distinguish hatchery-reared lobsters from wild stock. The meeting was successful because it was collaborative. It has evolved into an annual meeting, drawing all who are interested in the hatchery and its work.

"My divers and I have teamed up with the lobstermen," said Rick Wahle of Bigelow Laboratory for Ocean Sciences. "We compare release sites with control sites, watching the survival and growth of the hatchery-reared lobsters." Penobscot East Resource Center raised the funds for the 2006 field work and Maine DMR contributed support for the 2007 season.

For 2008 and 2009, a Maine Sea Grant award to Bigelow Laboratory is supporting an expanded collaboration to augment Wahle's field surveys with a genetic fingerprinting effort led by Gabriel Gerlach of the University of Oldenburg, Germany. While the field surveys are beginning to detect what is likely a positive effect of seeding juveniles at release sites, the genetic analysis, which is just getting under way, should be able to give more certainty to that result.

"The hatchery," says its manager, Ted Ames, "has been a fishermen's project all along that they gladly share with the scientists. It has been an open house for researchers to work collaboratively on projects or to get a supply of juvenile lobsters to do their own work."

The current financial stressors on the lobster fishery (e.g., fuel costs) make the accomplishment of lobster hatchery research more difficult, although the lobstermen are no less enthusiastic about it. Many more scientific questions are triggered by collaboration than can possibly be addressed at present, but the hatchery is a perfect example of community science, where local stakeholders are contributing to solutions.



Scientist Rick Wahle counts out Stage V lobsters.

Mid-coast Maine: **Port Clyde to Harpswell Sound**

Centers of fishing industry activity dot the seaward reaches of the bedrock peninsulas that dominate the landscape from the western tip of Penobscot Bay to Harpswell Bay. Lobster is the primary fishery today, but there are a few seasonal inshore groundfish, hagfish and shrimp fishermen in ports such as Boothbay, Phippsburg and Port Clyde. Herring is also a significant resource to this region. Numerous mud flats occur farther up the peninsulas, such as in Waldoboro, home to the largest clam industry in the state. Oyster and mussel beds are common as well. Estuaries host seasonal fisheries for alewife and elvers.

Mid-coast Maine has a long history of collaboration between industry and science. Since 2000, collaborations have involved more than 85 fishermen and their crews and over 36 scientists and students from the University of Maine's Darling Marine Center, Bigelow Laboratory, Maine Sea Grant, the Lobster Conservancy and the Maine Department of Marine Resources. The Island Institute has long worked with fishing communities, most recently the Mid-coast Fishermen's Association, centered in Port Clyde. Several scientists from outside the region (e.g., the University of New Hampshire, the Gulf of Maine Research Institute) are partnering with local fishermen in collaborative research funded by the Northeast Consortium or the Cooperative Research Partners Program.

The Visioning Meeting, held July 30 in Wiscasset, drew a mix of 18 collaborators: scientists, fishermen, state resource managers and collaborative research program staff.

The fishing docks of Boothbay Harbor are sandwiched between the hotels and vacation homes that dominate the waterfront.

Stakeholder Perspectives

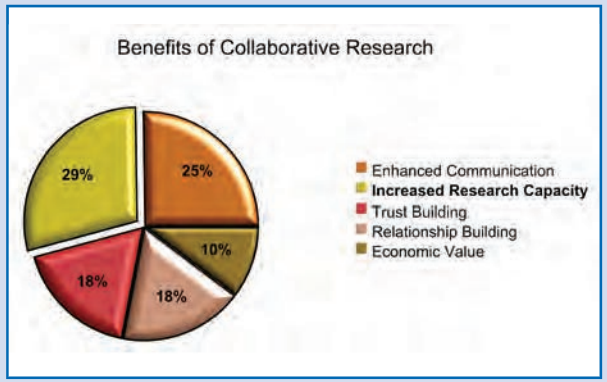
Science Impacts

- "For the past 15 years, the state has not had its own research vessel, but has been using fishing boats exclusively, **accomplishing just as much research**, if not more." – *state scientist*
- Collaborative research funded by the NEC on lobster larvae movement along the Maine coast is helping to understand the productivity of the fishery, and it has spurred follow-on research funded by the NMFS Coastal Ocean Program.
- "**Data collected on fishing boats** is trusted more by the wider fishing community." – *scientist*
- Gear selectivity research with the Island Institute and the Mid-Coast Fishermen's Association is helping to create local markets for groundfish.
- "The data sharing benefit of collaboration is huge. It starts with **establishing relationships and trust between people**." – *research facilitator*
- "Scallop enhancement projects have occurred in several areas of the coast. Developing spat collection techniques opens the door to a lot of research questions, such as where the larvae originate." – *scientist*
- "In 2007, the Island Institute hosted an annual lobster roundtable discussion on fishermen's observations on how climate change may be affecting the resource. A follow-up meeting this year had double the participation. This

Scientist Lew Incze and fisherman Jason Wells deploy a drifter.

Impact Assessment

Increased research capacity through collaboration with science and industry was the benefit most cited by meeting participants and regional survey respondents. The loss of research capacity was the most cited impact from a potential loss of funding. Several individuals felt that such a loss would significantly impair the ability of regional science and regulatory organizations to react to immediate and emerging fisheries issues. Other recurrent themes were the importance of enhanced communication between and among fishery stakeholders and improved trust between the fishing industry and science.



● *"Doing research has helped my association be more comfortable with science and know what's happening with the fish." – fisherman*

effort to get fishermen's knowledge has evolved and **people are really excited to contribute**." – *research facilitator*

● "Multi-stakeholder meetings on shrimp help push scientists to compare their own data." – *fisherman*

● "Collaborative research is about **the exchange of knowledge, teaching and learning**. When I want to know about lobsters, I go to the lobstermen." – *scientist*

● "The project I worked on came about when the lobstermen and I disagreed. We worked together from beginning to end." – *scientist*

● Lobster larvae settlement collectors, developed during a NEC project, are now being used in a survey that extends from Rhode Island to Canada.

● "**We trust fishermen to collect data** accurately and according to protocol." – *scientist*

● "Research using industry boats is not new, but now people are sitting down together at every stage of the research. Fishermen are contributing as equal partners. We now wouldn't dream of going back to the old way of doing things." – *scientist*

Management Impacts

● "**Ecosystem-based management requires a broad range of data**, not just what is gathered to answer the management question of the day." – *research facilitator*

A young dockhand in Boothbay Harbor.

● The first coastal survey for scallops (NEC-funded) was initiated to provide the basis for management. The Maine scallop industry has recognized that this work is valuable to their survival. An industry advisory council has been set up to oversee the Maine Scallop Research Fund (supported through annual licensed fees). The scallop survey continues and the data is used in managing the state fishery.

● Groundfish Amendment 13 allows composite mesh cod ends in trawl gear, a decision based on collaborative research data (NEC funded).

● "**Managers are now much more willing to accept data that was not collected by federal employees.** There must be a willingness to take peer-reviewed data and act upon it." – *scientist*

● A NEC-funded red crab survey formed the basis of the first full stock assessment since 1977 and the resulting fishery management plan.

● "It is still easier for states to incorporate collaborative research data at more local levels than with the federal system." – *state manager*

● Each fishery in Maine now has **a diverse, collaborative advisory council**.

Partnerships

● "Our association has helped fishermen be willing to participate in research as a group." – *fisherman*

● Fishermen are more comfortable with scientists and scientific processes after they have participated in collaborative research.

● "Research is **helping fishing groups begin to work together**." – *fisherman*

● "Research has helped me think, **'what can we do,'** not, 'what can you do to help me.'" – *fisherman*

● "For the most part, we've moved beyond 'us vs. them' approaches to problem solving." – *scientist*

● "We now have names to put to faces." – *fisherman*

Importance of Research Funding

● "If collaborative research fades away, the current participants might continue to partner somehow, but **what about the next generation?**" – *fisherman*

● "Look at the broad range of work that has been accomplished. The amount of data is tremendous. **We never would have had this without collaborative research funding.**" – *scientist*

● "We could spend time tinkering with gear years ago, but with so few groundfishing days available, it's really hard." – *fisherman*

● "Collaborative research funds got me through a couple of tight years." – *fisherman*

(continued on page 24)

Alewife Harvesters as "Citizen Scientists"

Quite often, collaborative research partnerships are forged after a fishery is declared to be in "crisis," but not so for ecologists and harvesters of the Maine alewife. They were already working on finding the answers to critical questions when management called for improved stewardship.

Scientists Theodore Willis and Karen Wilson began studying alewives shortly after their arrival at the University of Southern Maine in 2005. Inspired by fishermen's observations that cod followed (and ate) alewives inshore to their spawning grounds, they were curious about the importance of alewives to today's nearshore food web.

The Northeast Consortium funded the scientists and their partnering fishermen to compare the importance of alewife to predators' diets in Passamaquoddy Bay, Damariscotta River and the St. George River. They fished for cod and other alewife predators and set about assessing local alewife runs. "The fishermen greatly improved the science," said Willis, "since Karen and I relied on them for site selection and knowing the physicality of the environment."

Just as soon as the project got under way, NOAA Fisheries declared the alewife a "Species of Concern." Total river herring landings on the eastern seaboard had dropped precipitously in recent years and several states had already closed their fisheries. The Atlantic States Marine Fisheries Commission began work in January 2008 to amend the alewife management plan.

Aboard the **F/V Nordeste,** *Capt. Chris Taylor, left, and scientist Theo Willis choose where to fish using the sonar equipment .*

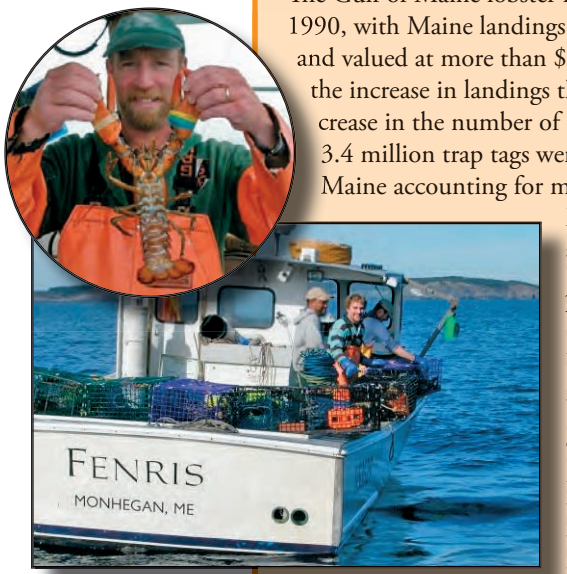
Although the alewife fishery is relatively small in Maine, valued at about $200,000/year and supporting about 400 harvesters in 25 towns, the potential shutdown took many by surprise and served as a wake-up call. Led by Jeff Pierce of Dresden, the newly formed Alewife Harvesters of Maine is helping fishermen be more engaged in the management process. By organizing, harvesters demonstrated a willingness to steward the resource and participate in research, which has helped prevent a management decision to close the fishery.

The research partnerships forged between the scientists, town officials, alewife harvesters, lobstermen, tribal leaders, land trusts and other groups have been lasting. Work on counting alewives in the St. George River has been funded through a Gulf of Maine Council/NOAA habitat restoration partnership grant. A Davis Conservation Grant funded additional alewife counting in the Damariscotta River, and Merrymeeting Bay Trust contributed funds to tag over 10,000 alewives in the Kennebec River to better identify natal homing, straying rates and inter-year survival.

Alewife harvesters have long considered themselves to be stewards of the runs, but partnership in research is opening new doors to them as "citizen scientists."

Inspired by fishermen's observations that cod followed (and ate) alewives inshore to their spawning grounds, the scientists were curious about the importance of alewives to today's nearshore food web.

How does trap density relate to lobster catch?



Top, Dan Murdock of the F/V Sylvia Anne *with a lobster that was caught several times during the project. Lucas Chioffi of the* F/V Fenris *and his crew.*

The Gulf of Maine lobster fishery has almost tripled since 1990, with Maine landings peaking at 70 million pounds and valued at more than $300 million. Coinciding with the increase in landings there has been a dramatic increase in the number of trap tags issued. In 2005, nearly 3.4 million trap tags were issued in Maine alone. With Maine accounting for more than 80% of the lobster landings in the Gulf, fishermen and managers are wondering just how resilient this resource will be with the increasing fishing pressure.

Over 10,000 fishermen have been affected by trap limits or effort reductions directly or indirectly, with the expectation that these limitations will maintain and enhance the lobster fishery. Are trap reductions actually the best approach to managing fishing mortality? Will current trap reductions be significant enough to impact the total lobster landings and therefore reduce fishing mortality? Carl Wilson of the Maine Department of Marine Resources and the lobster fishermen of Monhegan Island addressed these questions by investigating the fundamental relationship between trap density and catch rate.

What started as a project development award by the Northeast Consortium progressed into a multi-year research partnership with the Monhegan Island lobster fleet. Their goal was to "shed some light" on this critical management piece by conducting trap density experiments during the seasonal Monhegan fishery closure. "Fishermen were invested in the project from the beginning," Wilson stated. The unique regulatory environment, Monhegan Island being the only closed lobster area in summer months, made the experiment easy to conduct, he went on to explain. Mathew Thomson, the captain of the ***F/V Shearwater*** and a project participant, explained that "the project gave us the opportunity to get our gear in the water and see what's in the Monhegan Island Conservation area."

What resulted from this collaboration between science and industry was fewer traps and a longer season. Using their results, the industry was able to negotiate a longer season with Maine DMR, from six months to eight months by starting to fish Oct. 1 instead of Dec. 1. They also reduced the number of traps fished from 600 to 300 per fisherman. More than just lengthening the season, this project has benefited the industry by reducing bait, labor and most importantly fuel costs, increasing profit margins for the Monhegan community. Lobsterman and participant Matt Weber of the ***F/V Seldom Seen*** points out that "the cost of diesel fuel will match the price we get for lobsters. If we hadn't tried this and had another bad year, some of us would have been done."

New Ideas/Improvements

- "My proposals that involve fishermen tend to fare better, but **we still need more education of reviewers to the value of industry input**." – *scientist*
- "Without funds to continue data streams, we'll take steps backwards in management. We need both targeted and broad-based approaches to research." – *scientist*

Southern Maine: ***Portland to Kittery***

Portland is, by far, the largest fishing community in Maine. It matches New Bedford, Mass., in terms of the diversity of fisheries and it has the highest value per pound landed in the state. Although lobster is important, Portland lands the most groundfish, shrimp and pelagics in the state. Both inshore and offshore groundfishermen, using gillnets and otter trawls, locate here. A seasonal herring fishery exists here, too. To the south, smaller harbors like Saco, York and Kittery host primarily lobster vessels and a handful of urchin dive boats and stern draggers. Seasonally, fishermen target bluefin tuna. Some fishermen in southern Maine are more closely associated with New Hampshire, landing fish at ports across the border.

Since 2000, collaborative research has involved over 90 fishermen and their crews and seven industry businesses or organizations (e.g., the Gulf of Maine Lobster Foundation) based in the area. Over 34 scientists and 11 students from institutions based in the region (e.g., the University of New England, the University of Southern Maine Community College) have participated. The Gulf of Maine Research Institute, located in Portland, has a significant presence within the fishing communities of Maine and a commitment to working collaboratively with the industry. At least 65 scientists and students from outside the region have also teamed with local fishermen.

The Visioning Meeting, held July 31 in Portland, drew 15 scientists, fishermen, community program facilitators, grant writers and collaborative research program staff.

Portland is Maine's major fishing port and home to a variety of inshore and offshore fishing boats.

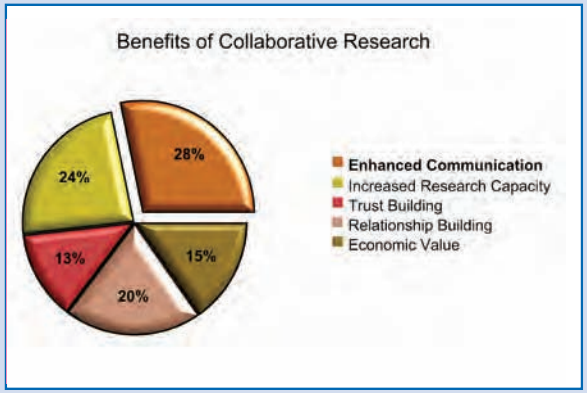
Stakeholder Perspectives

Science Impacts

- "I always knew my otter trawl tows were more beneficial going fair tide versus into the tide. In collaborative research, **I did tow studies that quantified and proved my theory**." – *fisherman*
- During a monkfish diet study, funded by the Research Set Aside program, fishermen suggested that the size of the fish caught be compared with diet. The study is showing that smaller monkfish tend to live in deeper, softer habitats. This validates the observations of gillnet fishermen, who fish in shallow, rocky habitats and see much larger monkfish in their nets than the NOAA trawl surveys, which are conducted in deeper water.
- "We worked with the engineers at the Memorial University flume tank on our study gear. I saw that the way I had been repairing my net was not 'close enough for government work.' **It made me a better fisherman.**" – *retired fisherman*
- "Opportunity to present and communicate collaborative research is very important." – *scientist*
- Tuna fishermen and scientists are observing that the average weight of the "giants" and the juveniles has dropped with the loss of prey stocks. "Back when there was bait, a legal sized 73" fish would weigh 480 pounds, but now they weigh 187 pounds. **They just aren't eating enough.**" – *fisherman*
- The industry-based surveys (CRPP funded) for cod and yellowtail flounder were able to demonstrate that a random-stratified sampling design surveyed the fishery adequately. It helped prove and disprove some preconceived notions.
- "**Collaborative research is the best idea going.** I can look 60 years back into my logs. The best thing I can do is open those logs to scientists." – *fisherman*
- "**What do I hope to get out**

Impact Assessment

For the fishing seaports of southern Maine, increased communication between the industry and researchers was most often cited as a benefit of collaborative research. Increased research capacity was also frequently noted. Meeting participants and those who completed surveys from the region cited loss of economic assistance most often when considering the consequences of a loss of funding. However, the loss of research capacity was strongly linked with economic support.



Maine/New Hampshire Inshore Trawl Survey Builds a Solid Foundation of Data

"The industry is comfortable with the data, knowing that the work is done on a fishing boat and by experienced fishermen," explains Sally Sherman of the Maine Department of Marine Resources in describing her collaborations with fishermen. Sherman is chief scientist of the Maine/New Hampshire Inshore Trawl Survey, which has conducted semiannual stratified random surveys at about 115 stations from the waters of New Hampshire to the Canadian border since 2000. The project is a close partnership with commercial fishermen and the two state agencies charged with managing the inshore waters.

Perhaps the most well known collaborative research project being conducted in the Gulf of Maine, it is establishing a solid foundation for long-term, fishery-independent monitoring of inshore waters. Stock assessment data on over 80 species is being provided for 80% of the nearshore waters of the northern Gulf of Maine, filling an information gap on the status and trends of groundfish and other species for which assessment data would otherwise be absent. The project complements data from the off-shore NOAA Fisheries bottom trawl survey and the Massachusetts Department of Marine Fisheries inshore trawl survey, which is also collaborative.

And is the data being used? Sherman states, "I cannot keep up with the requests for data." The team has provided data for the management of a number of species, including lobster, shrimp, crab, scallop, shad, herring, monkfish, cod, flounder and sturgeon. Most recently, the data was incorporated into the 2008 regional groundfish assessment for at least three species.

Funded in part by the Northeast Consortium and in part by the NOAA Fisheries Cooperative Research Partners Program (CRPP), the trawl survey continues to be funded on a year-to-year and even survey-to-survey basis through competitive programs. Long-term funding has yet to be secured, which makes the future of the survey uncertain.

Stakeholders at six of the eight visioning meetings shared how the data is providing critical information. "The new NOAA vessel cannot survey inshore waters due to vessel draft constraints. Continued collaboration with the industry is crucial to fill the data gaps," said Earl Meredith of the CRPP. A mid-coast-Maine fisherman summed it up well, "We need the trawl survey and the trawl survey needs the support of mainstream funding."

Crewmen aboard the F/V Robert Michael *bring a tow aboard. Today's catch includes a longhorn sculpin.*

of research? Personally? Nothing. The next generation of people who want to fish are going to be more knowledgeable. It's going to help all of tuna fishing." – *fisherman*

- "In 2006, the NEC sent me to an international meeting on gear technology in Boston. That was a priceless week. The booklet they gave out is like

● *"We would be set back 30 years if funding went away. We have a million more questions to ask."*
– fisherman

a dictionary of scientists. I haven't found one that doesn't answer me when I write them with questions."
– fisherman

Captain Brad Parady, aboard the F/V Angela and Ashley, *designs a juvenile shrimp trap for assessments.*

Management Impacts

● In the last dogfish stock assessment, data was used from collaborative research on dogfish bycatch survival rates in the gillnet and trawl fisheries. Recently collected data on dogfish survival in the hook and line fishery has the potential to impact the next stock assessment.

● "Years ago, we used to kill any shark we saw, but we learned from the scientists that all things have a place. **Knowledge has enabled us to be better stewards.**" – *fisherman*

● Collaborative research (CRPP funded) on a raised footrope whiting trawl opened up the fishery in Maine.

● Collaborative research refined Nordmore grate shrimp gear to improve catch selectivity. Several fishermen are now using the new system, which does not require a rule change to implement.

● The NEC-funded herring acoustic survey has contributed empirical knowledge about the distribution and abundance of inshore herring to the management process and was cited in Stock Assessment and Fishery Evaluation reports. The 2006 Transboundary Resource Assessment Committee report used the data, in conjunction with morphometric studies and NEFSC autumn surveys, to estimate the inshore component of the overall herring stock complex.

Partnership Impacts

● "I learned so much doing research, it's hard to know where to start." – *retired fisherman*

● A scientist's career in the U.S. began as an intern on a collaborative research project. It was "**a way to get to know and get known in this community**." All of her work since has been collaborative.

● The red crab fishermen have partnered with scientists a number of times in recent years with funding from NOAA and the NEC on stock assessment and gear selectivity. The industry is now seeking Marine Stewardship Council certification, and the same scientists are assisting with the process.

Importance of Research Funding

● "There is only so much money in my cod end. I don't have the ability to work for free." – *fisherman*

● "Research-Set-Aside programs are created because people see the value of collaborative research and want to continue despite the fickle nature of Congressional funding. RSAs have their own positives and negatives though." – *collaborative research staffer*

● "Research funding was a big deal for me for several years, sometimes 40% of my income, but there was a lot of pro bono time too. I don't know of anyone who was just given a gift; it was earned believe me. **The NEC gets good value for the money.**" – *retired fisherman*

● "I like the monkfish RSA. It's a point of pride to say that the research funds are paid for by the industry and benefit the industry. That's the value of the RSA. Funds were tight, but there are benefits to that. **The research itself provides value.**" – *fisherman*

New Ideas/Improvements

● "**Politicians are incredibly under informed individuals.** We need them to think creatively and independently in order for them to be productive partners, to see the value of collaborative research themselves, more than talking points." – *fisherman*

● "We need research. We can tell success story after success story. Washington doesn't want to hear it. They want to buy bullets." – *fisherman*

● "We need a much more in-depth economic study on how fish quotas translate to fish prices, and thus research dollars to make the funding formulas of RSAs fair for all." – *collaborative research staffer*

● "The 75/25 split formula for NEC funding means that you have to really watch what you do on the science side. **We run projects pretty tight to the line.**" – *scientist*

Cod Tagging Program Yields more than Stock Assessment Data

Stock identification is an important base for stock assessments. In the Northeast, stock identification can be controversial, especially in instances where scientific assessments do not reflect industry observations. It is for this reason that the fishing industry strongly advocates tagging to evaluate existing stock boundaries and assessments. The Northeast Regional Cod Tagging Program (NRCTP) began in late 2002 and represents the largest cod tagging program initiated to date along the eastern seaboard of the North American continent. The success of the program has largely been because of the commitment to conduct a successful collaborative research initiative, in which commercial fishermen work closely with scientists to realize project goals and objectives.

NRCTP seeks to use tag returns to monitor and identify cod migration throughout the study region, examine mixing between populations, and obtain growth information, as well as investigate the roles of temperature, depth and reproductive condition on migration and growth.

The program is coordinated by Shelly Tallack of the Gulf of Maine Research Institute. Participating organizations include the UMass School for Marine Science and Technology, the Cape Cod Commercial Hook Fishermen's Association, the Island Institute, the Maine Department of Marine Resources, the Manomet Center for Conservation Sciences and the Canadian Department of Fisheries and Oceans.

Since 2002, over 110,000 Atlantic cod have been tagged and released by the efforts of more than 100 vessels and 250 commercial fishermen throughout the Gulf of Maine, Canada and Southern New England. Over 30 scientists have also been involved and over 1,511 individuals have participated by reporting recaptures from more than 1,600 vessels and processor plants.

With the cod tagging project in particular, Tallack points out that "collaborative research is also useful outside of the field, from beyond the research capacity point of view, and provides opportunities through workshops to build relationships and facilitate communication between science and industry." These collaborations ultimately result in more efficient use of research dollars, better science and buy-in from the commercial fishing community.

Scientist Shelly Tallack and industry partners inspect the tagged cod before release.

● "I was in the room back when the 75/25 ratio was set up. It demonstrated the dedication to help fishermen get into the world of science. **The total funds need to be high enough so that each side has what it needs.**" – *retired fisherman*

New Hampshire: **Portsmouth to Seabrook**

Portsmouth, N.H., is home to a mix of lobster, gillnet and dragger boats.

New Hampshire has a small fishing fleet, with centers of fishing activity in Portsmouth, Rye, Seabrook and Hampton. Historically, the state's groundfish industry has benefited from its proximity to rich fishing grounds, but closures in the past decade and reductions in days-at-sea have made fishing more difficult for this region in particular. The lobster fleet is more diverse than the small-boat groundfish fleet, with both inshore and offshore vessels. A few fishermen have been harvesting cultured mussels. Shrimp and tuna are seasonal fisheries. Some fishermen work independently, while others work through cooperatives.

Since 2000, collaborative research has involved over 35 fishermen and their crews and six area industry organizations or businesses (e.g., the Atlantic Offshore Lobstermen's Association). Over 24 scientists and 60 students from area institutions (the University of New Hampshire, N.H. Fish and Game, and N.H. Sea Grant) are involved. Over 23 scientists from outside the region (e.g., NOAA, the University of New England, New York University) are partnering with local fishermen.

The Visioning Meeting, held August 4 in Portsmouth, drew a mix of 31 collaborators: scientists, fishermen, cooperative extension agents, fishery historians, marine educators, industry organization staffers, fishery managers, fish mongers and staff of collaborative research programs.

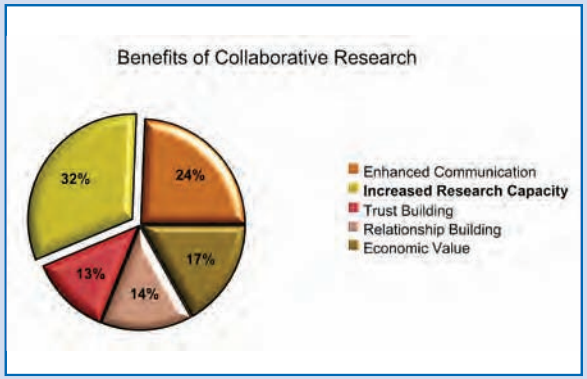
Stakeholder Perspectives

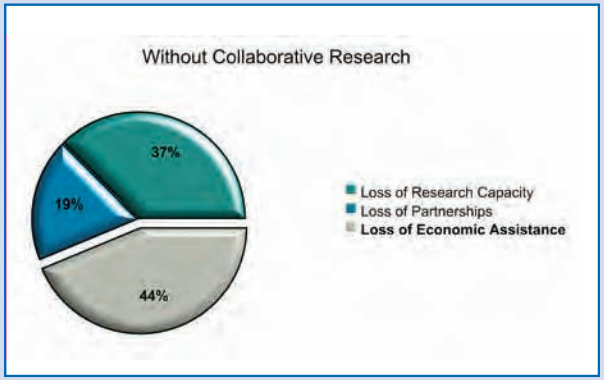
Science Impacts

- "I have a better understanding of the ocean than before I started." – *fisherman*
- "**The work we are doing on cod genetics is truly exciting.** The cod that spawn in Ipswich Bay in the spring are genetically different than those that come in the fall and from those in Mass Bay." – *fisherman*
- Fishermen and scientists funded by N.H. Sea Grant have been developing mussel spat collection and farming techniques. Mussel culture has been a commercial success. More fishermen are exploring this opportunity.
- "I've helped facilitate the writing of a lot of collaborative research proposals. Fishermen improve the science. **They push the scientists much more than scientists push scientists.**" – *research coordinator*
- "We are using multibeam acoustics, which traditionally ignore the water column, to see if it can be used for fishery stock assessments. **It's looking good for herring and cod.**" – *scientist*
- "The herring acoustic survey showed that the fall spawning closure missed the spawning event by two weeks. **We felt that the closure was too early, but this proved it.**" – *fishery manager*
- "Some projects have proved their hypothesis and some have came back with a different conclusion. That is not failure. It often **enhances knowledge and leads us in new directions**." – *fisherman*
- "The lobster fishery has had very little data. Catch, effort and biological data are going to ASMFC's lobster technical committee now. They can't get the information on their own." – *industry association staffer*
- "Collaborative research is a way to get some **ownership and direction for the fleet**." – *fisherman*
- An NEC-funded collaborative research project on skate biology formed the basis for seven articles, either published or in preparation, for scientific literature.

Impact Assessment

Stakeholders in this region most often cited increased research capacity as a direct benefit of collaborative research. In addition, enhanced communication between the industry and science was often referred to as a benefit. Many of the mobile fishing community have looked to collaborative research as a means to subsidize their operations during difficult financial periods. In fact, the loss of economic value from collaborative research was the most cited consequence of a loss of funding as well as the loss of research capacity.





● *"Cooperative research has increased the economic viability of the industry during tough economic times. It has supported scientists too." – marine educator*

Management Impacts

● "The Nordmore grate, developed collaboratively in Norway, was tested and refined locally with S-K, NEC and other funding. **The research helped open certain areas to shrimping.**" – *fishery coordinator*

● "I've seen a lot of improvement in the whole process as a result of these projects." – *fishery manager*

● "Fishermen have become more vocal and active, in a positive way, in management." – *marine educator*

● "The more research we have, the less things get cut down and down and down." – *fisherman*

● Over 56 reports from NEC projects, and many from NOAA projects, have been presented to federal and state fishery managers.

● A haddock separator trawl, called the "Rhule trawl," has been approved for use on eastern Georges Bank.

● Skate biological collaborative research data was incorporated into the 2006 Skate Annual Review and incorporated into management plan revisions. It is also being used in the current groundfish assessment.

● "A number of gear projects are being used in management to give fishermen more options. For **just about every species you can think of**, someone has done some collaborative research." – *fisherman*

● Stock area boundaries for lobster were changed to reflect what collaborative research found.

● "**I look forward to the rest of my fishing career.** We need research to keep the management good." – *fisherman*

Scientists Ray Grizzle and Krystin Ward study an area closure aboard the F/V Lori B.

Partnerships

● "Collaboration is amazing. **It creates a trust factor** that didn't exist before. Fishermen can bring forward their own ideas." – *industry association staffer*

● "The fishermen have been vital to our understanding of cod stock identification. They know where the fish are and what reproductive state they are in. We couldn't have done the project without them." – *scientist*

● "Understanding has increased within the industry and with scientists. **Deep friendships have developed.** It has drawn the community together." – *marine educator*

● "**Without the fishermen, we work in a black box.**" – *scientist*

● "Applied research deals with real problems. You have to involve the communities affected." – *social scientist*

● "There are big differences between collaborative research and contracting. By having fishermen as major partners, we can adjust and achieve goals **to do something more useful**." – *scientist*

Importance of Research Funding

● "Sure, the research funding goes to just the fishermen who participate, but hopefully the outcome **will improve fishing for all**." – *fisherman*

● "My project would not have happened without the finances to pay for the boats." – *scientist*

● "It seems like the more we take an active role in what we might not agree with, the more it will help change the conversation. **We have to think forward.**" – *fisherman*

● "In Study Fleet, the fishermen are paid a modest sum to collect data on a limited number of trips. Probably 95% of the people in the program use the software to record their catch on every trip. They take an interest in it, and they enjoy it. **It develops into something more than being just about the money.**" – *collaborative research program staffer*

● "We can't waste government money. We need credible studies and openness. Not everyone has the answer. That is why we work together." – *fisherman*

Shrimp Gear Innovations Lower Counts, Raise Profits

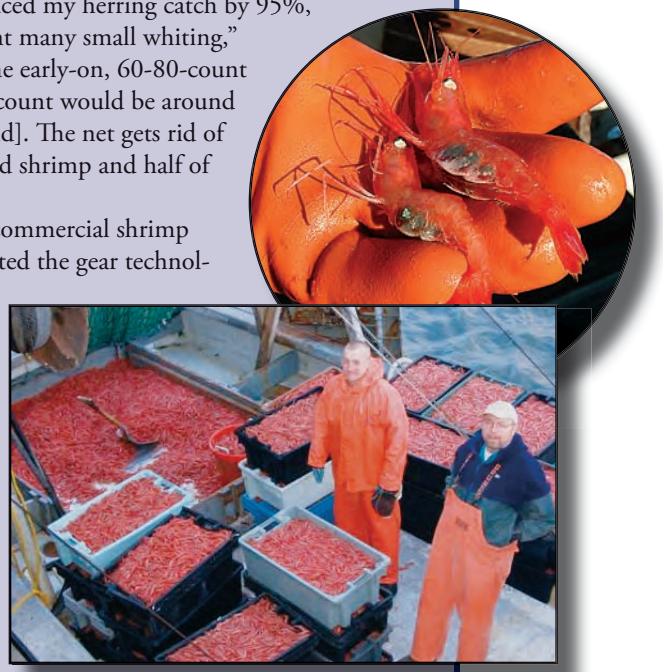
The reappearance of robust northern shrimp stocks, believed to be the result of strong 2003 and 2004 shrimp year-classes, has had industry people hoping they will be able to maintain a product stream that could translate into increased economic benefits and stability for harvesters and processors. However, stock abundance is not the only element for an economically viable shrimp fishery. Current market conditions – low worldwide shrimp prices, cheap warm water shrimp, low prices for cooked/peeled northern shrimp out of Newfoundland, and a 20% duty to export into Europe – have diluted the U.S. market. To improve size selection and reduce bycatch, Vincent Balzano, captain of the ***F/V North Star*** out of Portland, Maine, and David Goethel, captain of the ***F/V Ellen Diane*** out of Hampton, N.H., have been working with Pingguo He of the University of New Hampshire to develop two innovative gear modifications.

With support from the Northeast Consortium and NOAA's Northeast Cooperative Research Partners Program, the team has designed, manufactured and evaluated a new dual-grid size-sorting system that decreases small shrimp landings, as well as a topless trawl modification aimed at eliminating herring bycatch.

Bob Campbell, manager of the Yankee Fishermen's Cooperative in Seabrook, N.H., stated, "On a given day, vessels using the dual-grid system have had lower counts than the fleet average." Campbell also pointed out that if demand was higher, having a lower count would provide more opportunities for increased revenue.

"The net has reduced my herring catch by 95%, and we haven't caught many small whiting," Goethel said. "For the early-on, 60-80-count shrimp catches, our count would be around 50 [shrimp per pound]. The net gets rid of all of the one-year-old shrimp and half of the two-year-olds."

Since 2005, five commercial shrimp fishermen have adopted the gear technology. It is anticipated that at least 17 fishermen will utilize at least one of the gear adaptations during the 2008-2009 season.



Capt. David Goethel and a crew member display their clean catch.

New Ideas/Improvements

- "We need more venues **for fishermen and scientists to think together** about emerging issues that need research." – *socioeconomist*
- "Acoustics is a bona fide research technology used all over the world. Why are we so slow to use it here?" – *fisherman*
- "Collaborative research needs to become accepted by more mainstream funding sources." – *social scientist*
- "We are always looking at overfishing as the culprit. The fishing fleet is

PULSE Helps Fishermen Understand Science

Whether natural, man-made or a bit of both, shifts in the Gulf of Maine marine ecosystem have the potential to trigger changes that can affect everything along the food chain from phytoplankton right up to herring and juvenile cod. That is why scientists are working with commercial fishermen on the "PULSE" of the Gulf of Maine. The Cooperative Partnership for Coastal Ocean Ecosystem Monitoring in the Gulf of Maine was started in 2001 by Jeff Runge, at that time a research professor at the University of New Hampshire's Ocean Process Analysis Lab, now at the Gulf of Maine Research Institute. The PULSE project samples for plankton, a term used for any living thing that resides in the water column and is at the mercy of the currents and tides. Contained within the plankton are important fish eggs and larvae in various stages of development.

Capt. Alan Vangile and scientist Rebecca Jones filter plankton out of seawater.

As part of the PULSE project, researchers offer workshops to introduce fishermen to oceanographic sampling protocols and zooplankton identification. During these workshops, fishermen get a hands-on education on microscopy and sampling methods in the laboratory. George Littlefield, a N.H. commercial fishermen and PULSE participant, enjoyed learning how to sample zooplankton and identify them under a microscope, and explained that "It is important to understand where and when food sources appear and disappear for the better management of our fisheries."

In a truly collaborative approach to oceanographic monitoring, each week fishermen and scientists sample zooplankton, phytoplankton, hydrography and nutrients at fixed nearshore and offshore stations in the Gulf of Maine. The project has expanded south to involve the Massachusetts Fishermen's Partnership. The goal is to record a long-term history of seasonal changes in plankton organisms. This data should eventually help fishery managers predict how many fish the ecosystem is capable of supporting. A total of 17 fishing vessels and their crews have participated in the PULSE project to date. The increased monitoring capacity leveraged by the commercial fleet would not be possible otherwise. Littlefield urged other fishermen to pursue collaborative research. "Many fishermen are skeptical about fisheries science," he said. "I was, but after participating and seeing how research is done and what it has to offer, I've changed my mind."

almost gone in coastal New Hampshire. There has to be something else going on. We need more diverse topics funded to figure this out." – *fisherman*

- "We need more stakeholder meetings about what's happening in the ocean, what research has been done, and what we need to research." – *social scientist*
- "Funding is competitive. **If you aren't happy with what is funded, get involved.** Be a reviewer. There is a lot a fisherman can do to be sure the money is well spent." – *fisherman*

Northern Massachusetts: ***Salisbury to Plymouth***

There are several fishing communities in northern and central Massachusetts, but the largest is Gloucester. Most fishermen are full-time groundfish fishermen or lobstermen. There is a significant offshore groundfish fleet, but the day boats tend to switch fisheries seasonally. Smaller fisheries include scallops, hagfish, shrimp, whiting, herring, swordfish and tuna. Today, very few vessels moor in Boston, but it remains a significant port in terms of transporting fishery products. Small but significant fishing industries exist in Newburyport, Rockport, Marblehead, Scituate and Plymouth.

Since 2000, collaborative research has involved over 68 fishermen and their crews and six industry businesses or organizations (e.g., the Massachusetts Fishermen's Partnership, the Gloucester Fishermen's Wives Association) based in the area. Over 26 scientists and several students have participated from area institutions (e.g., Massachusetts Division of Marine Fisheries, Northeastern University, the Massachusetts Institute of Technology, Boston University). At least 40 scientists and students from outside the region (e.g., the Gulf of Maine Research Institute, the University of New Hampshire) are partnering with local fishermen.

The Visioning Meeting, held August 5 in Gloucester, drew a mix of 16 collaborators: fishermen, scientists, collaborative research program staff, boat designers, industry association staff and extension agents.

The proximity of Rockport Harbor to the industry infrastructure of Gloucester helps it maintain a viable, if modest, fleet.

Stakeholder Perspectives

● *"Scientists do not question the quality of data collected on my boat. That wasn't the case eight years ago."* – *fisherman*

Science Impacts

● Ecosystem management needs data that is fishery-management driven in addition to data that answer broader or more long-term questions.

● "The Industry-Based Survey for cod within Massachusetts waters [CRPP funded] was a landmark survey in terms of how successful it was. **It put cod back on the map.**" – *fisherman*

● "The cod IBS contract came with project goals outlined. However, the fishermen helped create an initial map of where cod are and when, and we designed the survey around their knowledge base. It was a high-resolution, intense survey, but **fishermen knew how to get it done**. They saved us many days. We could not have accomplished it using the state boats." – *state scientist*

● A shrimp beam trawl, developed during a fisherman-led, NEC-funded project in 2003, was recycled to study the role of sand lance in the Stellwagen Bank ecosystem by Boston University, the New England Aquarium, the Mass. Fishermen's Partnership, the National Marine Sanctuary, and others. Today, collaboration has continued between partners.

● "Team meetings help unify the partners. The scientists completely trust the data collection." – *research coordinator*

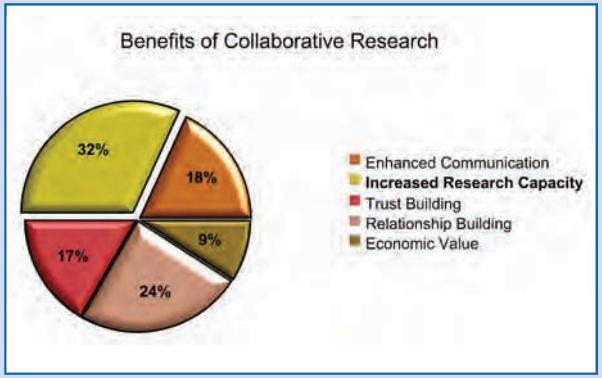
● "So many **opportunities open for fishermen who get involved**. Here is a fisherman who is now a guest lecturer of a graduate class." – *industry association staffer*

● "There is tremendous benefit to

(continued on page 38)

Impact Assessment

Stakeholders in the region cited increased research capacity through collaboration with science and industry as the major benefit, and the loss of research capacity was the most cited impact of a potential loss of funding. Other recurrent themes were the importance of relationships that are built among fishery stakeholders through the collaborative process and the loss of these partnerships that may result from reduced funding opportunities.



Sweepless Raised Footrope Trawl Reduces Bycatch and Seabed Impact

Due to high bycatch, the small-mesh whiting fishery has been a concern for fishery managers since the late 1980s. Commercially important and threatened groundfish stocks such as cod, haddock and American plaice, as well as witch, winter and yellow-tail flounder represent the majority of discards in the fishery.

"Industry was aware of the bycatch problems in the whiting fishery before the fishery was actually closed," explained Mike Pol, a scientist with the Mass. Division of Marine Fisheries (DMF). Early on, Arnie Carr, retired DMF fisheries scientist, conducted separator trawl work that would begin to address the issue of bycatch in this fishery. Carr observed that whiting would remain high in the mouth of the net when approached by a bottom trawl while flounder would not. This observation was applied to the discard problem with the evolution of the Raised Footrope Trawl (RFT). The RFT added dropper chains to the sweep bringing the net off from the bottom and giving flounder an opportunity to escape capture. Henry Souza, a Provincetown dragger, figured out how to rig the gear and make the RFT work for commercial fishermen. Souza collaborated with Henry Milliken, then a conservation engineer with DMF, and Carr to technically evaluate the RFT's ability to virtually eliminate bycatch. "When the exempted fishery was approved, language was included to allow a sweepless RFT in addition to the RFT," explained Pol. The sweepless RFT removed the sweep altogether, limiting seabed contact to only a few dropper chains that would "tickle" the bottom. Also, the sweepless trawl reduced hang-ups with lobster gear, an early problem, as well as reduced seabed impact.

Scientist Henry Milliken installs an underwater video camera.

In 2000, an exempted whiting fishery in Upper Cape Cod Bay and southern Stellwagen Bank was created through Framework Adjustment 35 to the Northeast Multispecies Fishery Management Plan. The New England Fishery Management Council and NOAA Fisheries embraced this exemption based on observed bycatch levels during collaborative at-sea pilot studies that were consistently below 5%. This created an economic opportunity for regional fishermen who were previously impacted by area closures. Under Framework 35, the use of the RFT was mandated in the Provincetown-area exempted whiting fishery. "If it wasn't for projects like this, many of the fishermen in Provincetown and the small boats in Gloucester would be out of business. I'm whiting fishing right now in the bay," states a Gloucester fisherman.

This created an economic opportunity for regional fishermen who were previously impacted by area closures.

Ventless Trap Survey Expanded

Mass. DMF technician Steve Voss samples the catch from a ventless trap station in Boston Harbor aboard **F/V Finest Kind.**

In 2004, Massachusetts commercial lobstermen, industry organizations and state lobster biologists collaborated to design and implement a fishery-independent survey for the American lobster in Massachusetts Bay.

Funded by the Northeast Consortium, the initial two-year study involved four lobstermen each year and two industry liaisons from two lobstermen's associations. Teaming with Bob Glenn and other scientists from the Mass. Division of Marine Fisheries, 80 depth- and sediment-stratified stations were sampled with a six trap trawl composed of vented and non-vented traps, which were hauled twice monthly from May through November in 2005 and again in 2006.

In addition to gaining more knowledge about the health of the lobster resource, this project strengthened the relationship between the commercial lobster industry and the state and fostered industry "buy-in" to the lobster stock assessment process. The participating lobstermen have been sharing what they have been seeing in the study, either over the radio, around the dock or at industry association meetings.

The success of this random stratified ventless trap survey has led the Lobster Technical Committee of the Atlantic States Marine Fisheries Commission to adopt the survey methods for an expanded survey in 2008 that stretches from Maine to Long Island Sound. This is the first time that a completely standardized fishery-independent survey for lobster has been conducted across states. Lobstermen from each state are participating and contributing to the stock assessment. As word spreads about the data that fishermen are helping generate, more and more fishermen become confident in the way lobster stocks are monitored. The industry has a stronger sense of stewardship as it becomes an integral part of the research.

In addition to gaining more knowledge about the health of the lobster resource, this project strengthened the relationship between the commercial lobster industry and the state and fostered industry "buy-in" to the lobster stock assessment process.

a stakeholder-driven collaborative research program, especially during proposal review, when all have an equal voice. **It's not about what one interest is looking for.**" – *collaborative research program staffer*

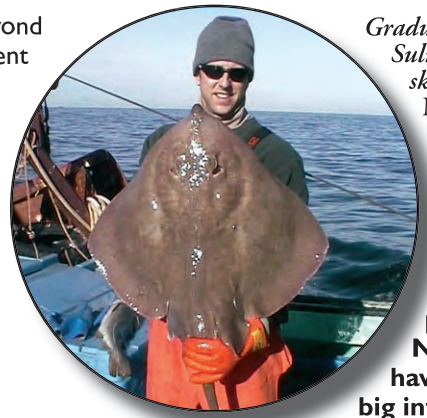
- Fishermen in Gloucester and elsewhere are partnering with boat designers **to reduce the carbon footprint of fishing**.
- "A collaborative research program fostered by academic institutions and stakeholder driven provides the latitude for innovation to occur." – *research facilitator*

Management Impacts

- "**We did show how important Mass Bay is for Gulf of Maine cod with the Industry-Based Survey.**" – *fisherman*
- "Many projects have not yet run their course. My hope is that people value the broader impacts that collab-

oration has had, beyond just what management actions have been influenced to date." – *industry association staffer*

- "The communication link to management and the bigger picture is essential." – *scientist*



Graduate student James Sulikowski with a thorny skate aboard the F/V Mystique Lady.

Partnerships

- "I can count 20 different collaborative projects I have worked on. I hardly do anything that isn't collaborative." – *scientist*
- "Some fishermen were against me participating. They thought I'd sided with the enemy, but that has mostly changed." – *fisherman*
- "**The state scientists have become our best allies.**" – *fisherman*
- "Many people saw us come back to the wharf after a day working on the project. They could ask their questions right there." – *fisherman*
- "From this one project, **I have met scientists and students from four institutions** and a fisherman from P-town. Now, I'm swapping gear with him and have met most of the guys from his port." – *fisherman*
- Fishermen have been invited into the labs of their science partners to better understand how their samples would be processed and the reasoning behind the sampling collection techniques a particular project requires.
- "I've observed two changes over time. The industry used to think that 'data will be used against me.' Science thought that 'fishing boats were only a research platform.' **The NEC and CRPP have both had a big influence in our thought.**" – *industry association staffer*

Importance of Research Funding

- Rising fuel costs impact the cost of conducting research. More research could be accomplished if the fleet was more fuel efficient.
- "If we didn't have funding, we could only rely on the kindness of industry to volunteer." – *scientist*
- Massachusetts has received mitigation funding from projects, such as the construction of sewage pipelines or liquified natural gas terminals, that have gone to supporting collaborative research on the impacts of these activities.

New Ideas/Improvements

- "We stress that **industry participants need to see the final report** of a project before it gets finalized." – *research facilitator*
- "There are big gaps in our knowledge of dogfish, which collaborative research could be addressing." – *industry association staffer*
- "**Some people still think collaborative research is a private club.** We need more efforts to tell how research is benefiting fishermen in general." – *fisherman*
- There needs to be more effort communicating the results of projects. Fishermen tend to get information more from industry newspapers or newsletters rather than on-line sources.
- "We need more research on nearshore coastal impacts, such as runoff and pollution, to learn the impacts on nursery grounds." – *collaborative research staffer*
- "Should we have a large, central repository to find what data is out there on a particular species or ecosystem? **It's still very hard to find out what all has gone on.**" – *scientist*

- *"The Northeast Consortium is not an endless funding source for a project. Mine is a perfect example of how a small project grew and led to other funding." – fisherman*

The Cape and Islands: **Woods Hole to Provincetown**

Chatham, Mass., serves as Cape Cod's major fishing port.

Out on the Cape, the tourism industry is the only rival to fishing in terms of importance to the local economy. The day-boat fishing ports of Chatham, Provincetown and Vineyard Haven are the most active. Chatham has a significant longline/hook fleet, in addition to gillnet and lobster vessels and a shellfish industry. Provincetown hosts a small dragger fleet. A few fishermen in the region work seasonal fish weirs for herring, scup and squid. Local demand for seafood is strong, but fluctuates with the tourist season.

Since 2000, collaborative research has involved over 80 fishermen and their crews and five industry businesses or organizations (e.g., Cape Cod Commercial Hook Fishermen's Association) based on the Cape. Over 31 participating scientists have been from local institutions (e.g., Northeast Fisheries Science Center, U.S. Geological Survey, Woods Hole Oceanographic Institution). At least 30 scientists from outside the region (e.g., New England Aquarium, University of New Hampshire) have partnered with local fishermen.

The Visioning Meeting, held August 7 in Chatham, drew a mix of 22 collaborators: government and academic scientists, fishermen, students, fishery observers, state senate staff and managers of research programs.

Stakeholder Perspectives

Science Impacts

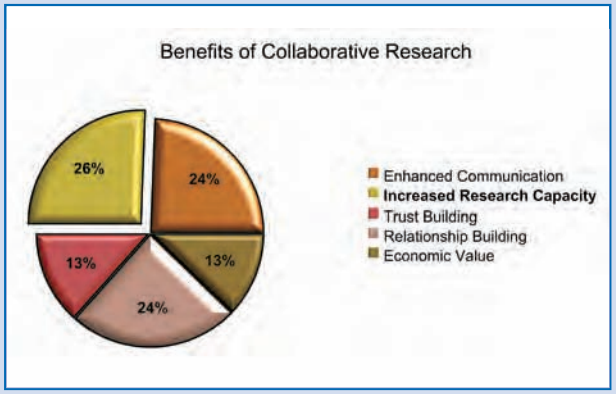
● "**Industry collaboration has dramatically changed the way I do research.** When I started in the 1980s, we got big government grants to go out on big research vessels for two to three weeks at a time to make sense of Georges Bank with expensive instruments. It didn't make much sense to me. We saw dozens of commercial boats. They could help us year-round. In fact, they were interested in helping." – *scientist*

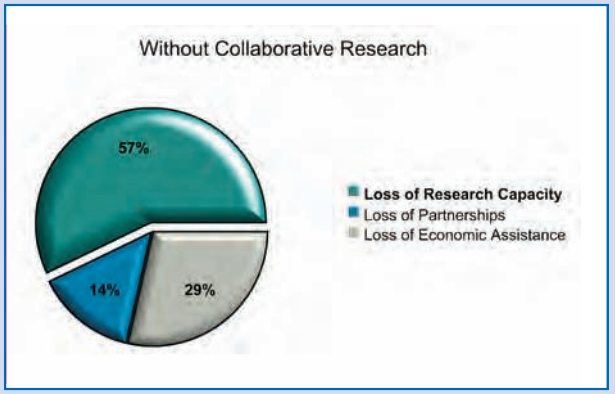
● "My first job out of college was working with lobstermen doing ventless trap surveys and habitat studies. The lobstermen were very cooperative. Now, I'm an observer in a regulatory capacity. They view me differently, but once they see me work hard, I earn their trust." – *fisheries observer*

● Collaboration with Florida fishermen for 12 years studying dolphin and reef fish (MARFIN and S-K funded) helped prepare a NOAA scientist for his work in the Northeast.

● Turtle bycatch in fishing gear is becoming an increasing issue in the Northeast. NOAA has been working with fishermen on solutions to improve the catch rate of summer flounder with turtle excluder devices attached to gear. Partners have found that improving selectivity and profitability increases the acceptance of the gear within the industry.

● "The sampling design for my project was all **based on fishermen's**





Impact Assessment

Those who participated in the survey and the Visioning meeting from the Cape and the Islands region most often cited increased research capacity as a benefit of science and industry working together to address fisheries concerns. Almost as frequently, they referred to the relationships that have resulted from research projects and been maintained, as well as the lines of communication that have opened. If funding was lost, stakeholders cited a loss of research capacity to the region and of economic assistance for participating fishermen as the major consequences.

● *"What the NEC has done very successfully is helped science realize the value of the information coming from the industry and helped stakeholders understand each other." – scientist*

● *"Younger fishermen know that to sustain the fisheries, you have to get together with science." – fisherman*

Marine Fisheries Initiative Makes Local Industry-Science Connections

Owen Nichols of the Provincetown Center for Coastal Studies was in a coffee shop one day in 2001, contemplating a map of right whale sightings in Cape Cod Bay. "One of our local lobstermen leaned over my shoulder," he explains, "jabbed his finger right into the middle of the plot, and said, 'I fish right there, what are all those dots?'" That was the beginning of a conversation with industry that has grown into the fledgling Marine Fisheries Initiative.

Nichols, a native of the Cape, wanted to work with the local industry, and he found that the feeling was mutual. "Some had done research before," Nichols explains, "but they wanted to work with local people, to be able to get someone on the phone at any time, ask questions, exchange gear or show up within a few hours."

The Initiative's inaugural project began in spring 2008, in direct response to concerns of Nantucket Sound fishermen that squid eggs could be vulnerable to fishing gear before they hatch. Together, Nichols and the fishermen are investigating the time of hatching and the association with environmental factors such as water temperature. Nichols is also working with commercial weir fishermen in Chatham, studying distribution of longfin inshore squid relative to temperature, salinity, wind and other factors. This project is part of Nichols' doctoral research and is funded by the Massachusetts Marine Fisheries Institute, the Norcross Wildlife Foundation/A.V. Stout Fund, and the Sounds Conservancy/Quebec-Labrador Foundation.

Fisherman Shannon Eldredge (left) and biologist Owen Nichols haul a commercial fish weir in Nantucket Sound.

observations of where the fish are." – *scientist*

● "It's important that if fishermen help us collect data, we give it back to them as quickly as possible. **Our goal is real-time data collection and delivery.**" – *scientist*

Management Impacts

● "At Council meetings, the scientists have become better at simplifying and **putting things in laymen's terms**. I have a right to know what they are talking about." – *fisherman*

● "The whiting raised footrope trawl got the Provincetown fishermen, who were tied up, out fishing again on this underutilized species." – *state scientist*

● "It's important to the guys in Chatham that they prove the gear they developed works within the bycatch limit. They want true data." – *fisheries observer*

● After closure of the Chesapeake Bay pound net fishery due to sea turtle interactions, a Woods Hole scientist spent two years with the fishermen, testing gear innovations that they

Research coordinator Mel Sanderson measures a juvenile cod.

designed to solve the problem. The data gave access to the fishery again. The design is being used to minimize bycatch of other species in other areas.

- The "Ribas" net design (NEC funded) proved to minimize bycatch and was included as an option for the inshore flatfish fishery in Amendment 13. The net has been scaled up, was tested offshore (S-K funded), and is showing potential for expanded use.

Partnership Impacts

- "I get calls 'Do you want to come out, my crew member is sick.' You gotta do it. I ask so much of them; **I have to give back**." – *extension staffer*
- "Now my employment involves site visits on boats. **It is a huge compliment to be invited back**." – *collaborative research program staffer*
- "The NEC has helped us get started, but we have found ways to be viable." – *scientist*
- "For this project, the trust was difficult to build. The process of understanding each other and building a research design was slow, but patience paid off. **It was a study fishermen could put their name on.**" – *scientist*
- "I enjoy his work. It's a great idea to work together, it makes so much sense." – *scientist's wife*
- "I had an injury that prevented me from fishing, but being a technician on a research project has helped me stay connected with the community." – *industry technician*
- "Seeing the value of collaboration and on-the-water experience, an environmental advocacy group is now pushing its staff to connect with the industry and get out of the 'ivory tower.'" – *disentanglement coordinator*
- Environmental and industry groups have been collaborating to conduct seal surveys since October 2007. "**The temperament about seals is dynamic and interesting.** Collaboration is the road to tackle issues." – *scientist*

Importance of Research Funding

- "The grants can't stop at Woods Hole. The funds must include the fishermen." – *fisherman*
- "For my thesis work, a fisherman offered to put a temperature sensor on his trawl door simply in return for the data. Funds would have been needed if the research hampered his normal fishing day." – *graduate student*

Ideas for Improvements

- "Management trusts only the Science Center (the government) to do the work. All the work that is collaborative has a hard time infiltrating. That must be really frustrating. **What you want is a positive loop, fishermen feeding data into management.** Look for the holes in government data and fill them. If you bring data to fill the hole, they can't ignore it." – *international visiting scholar*
- "Our region is beginning to coordinate oceanographic research, to change the way data is collected and shared. It's been slow going; there isn't a lot of money. Fishermen could make a big contribution to making coordinated, cost-effective ocean observing work." – *scientist*
- "Collaborative research should expand into **chemical, biological and physical monitoring of the ocean**." – *scientist*
- "Something has to change in our society. I'm a federal employee and **it now takes me a year longer to get a research project going**. There are so many issues that someone has to check off, in terms of habitat, protected species and more." – *scientist*
- "**Research needs are only increasing.** Habitat. Protected species. Seabird and species bycatch." – *scientist*
- "There are several different approaches to funding: a tax on the industry, research, quotas, Congressional appropriations. Is there something untapped?" – *scientist*
- "One way to bypass grants is to work with fishermen on a new product or gear idea that could be a seed for a small business, with some of the income set aside for future research. We are helping develop a low-cost

- *"The scientists didn't know how to talk with us. They used to come on board as gods."*
– fisherman

Bait Studies Help Fishermen Target Haddock

With the rejuvenation of haddock stocks in the Gulf of Maine, fishermen were given an economic glimmer of hope. However, haddock are part of a mixed fishery and share habitat with other commercially important and threatened groundfish stocks, such as cod and yellowtail flounder. Poor recovery of cod stocks has limited access to fishing grounds that support healthy, fishable stocks of haddock. For hook fishermen, it has been difficult to target haddock without surpassing the 500-pound cod trip limit. The chance to harvest haddock led to collaborative research funded by the Northeast Consortium between the Cape Cod Commercial Hook Fishermen's Association (CCCHFA) and Susan Goldhor, a scientist with the Center for Applied Regional Studies in Cambridge, Mass. Mel Sanderson of the CCCHFA explains, "We were looking for ways to create more selectivity within the fishery to be able to target haddock without catching cod. We saw that as haddock were recovering, much of what would limit access to haddock would be cod bycatch."

Hook fishermen know that using different baits (squid, herring, clams and mackerel) would affect what they caught. For instance, cod prefer clams and squid while haddock will scavenge on practically anything. Taking advantage of these natural preferences, the collaborative research team used a fabricated bait (Norbait™) to target haddock. This industry-borne project, with more than 12 fishermen participating, showed potential for targeting haddock in the long-line fishery. These findings were put through the New England Fisheries Management Council process, resulting in access to Closed Area I for six weeks per year over the last four years. The initial project was expanded to investigate the use of alternative baits in different areas, funded entirely by proceeds of fish sales from the early project. Presently, there is a proposal in Amendment 16 to expand the fishery based on this additional data.

Research, Environmental and Management Support observer Anne Magoon collects data for the haddock project.

These findings were put through the New England Fisheries Management Council process, resulting in access to Closed Area I for six weeks per year over the last four years.

bottom current sensor. Fishermen want to buy them for their own use, but we are interested in the data, too." – *scientist*

- "For collaborative research to win funding, it must answer our pressing data needs." – *scientist*
- "The NEC has effectively bridged the gap between fishermen and scientists. **It is built on stakeholder relationships.** We need to find the future role of the program. Should we continue as is or make some adjustments? Perhaps there should be fewer projects funded, but to the level of detail that really answers our questions. Larger sample sizes to allow more rigorous statistics." – *scientist*
- "We need to maintain organizations outside of NOAA that can provide mechanisms to foster industry's ideas for research that meet management needs." – *federal scientist*
- "I review a lot of final reports that may go forward. Research needs to be more robust to make definitive statements. We need funding to the level that questions can be answered." – *federal scientist*

Southern Massachusetts: ***Wareham to Westport***

Although fishing occurs out of Dartmouth and Westport, New Bedford and Fairhaven are the dominant fishing centers in the region. The port of New Bedford has historically been one of the top U.S. fishing ports and claimed the top spot for value of landings in 2007, primarily due to sea scallops, which brought in $268 million. Offshore draggers and scallop vessels dominate the piers. There is a significant fishery for monkfish, and some vessels target swordfish, tuna, fluke, squid or skates. Smaller fisheries include hard shell clams, conch, scup and sea bass.

Since 2000, collaborative research has involved over 46 fishermen and their crews and seven industry businesses or organizations (e.g., Shore Support, the Whaling City Auction) based in the area. Over 17 scientists and 60 students from local institutions (e.g., the University of Massachusetts, the Massachusetts Division of Marine Fisheries) have participated. At least 15 scientists and students from outside the region (e.g., NOAA Fisheries, the Virginia Institute of Marine Science) are partnering with local fishermen.

The Visioning Meeting, held August 6 in New Bedford, drew a mix of 44 collaborators: academic and government scientists, fishermen, students, international visiting scholars, fisheries observers and managers, and staff of collaborative research programs.

New Bedford, Mass., hosts the most diverse fleet in New England.

Stakeholder Perspectives

Science Impacts

● Scientists and lobstermen have been working off the coast of Rhode Island to restore habitats and fisheries from the impacts of a 1997 oil spill.

● "There were things I learned on the trips. **I thought I was too old to learn anything.**" – *fisherman*

● "Fishermen are constantly monitoring the ecosystem. It is science that has been catching up. My technical training did not prepare me for ecosystem-based science." – *scientist*

● "**The first person who dragged me into collaborative research** was the captain of NOAA's ***R/V Albatross***. There was a huge controversy within the Council, back in 1978, just a few years after Magnusson was passed and the Council was in its infancy. There was a disconnect about mesh selectivity and the minimum fish size that could be retained. So, we went out in hellacious weather to test different mesh sizes. We brought some revelations back to the Council. Increases in the cod end mesh size have been a major contribution to the resurgence of fish abundance in New England. I have fond memories of the process." – *fisherman*

● "**When you do good research, the results last.** We used those '78 results to help our recent work." – *scientist*

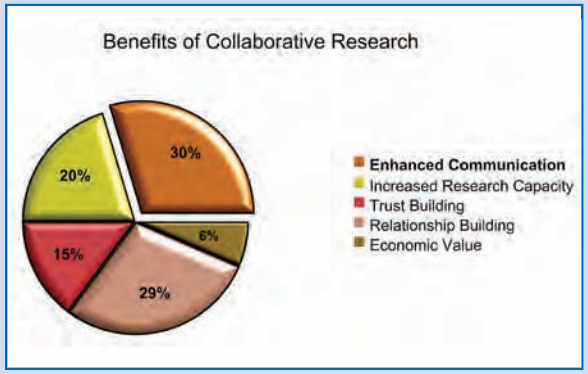
● Scallop fishermen and university scientists have been conducting video surveys of the seafloor for several years with RSA and other funding as an alternative method for measuring scallop abundance to the federal survey. Fishermen help analyze the data and write additional proposals. The work has resulted in several scientific papers and several student theses.

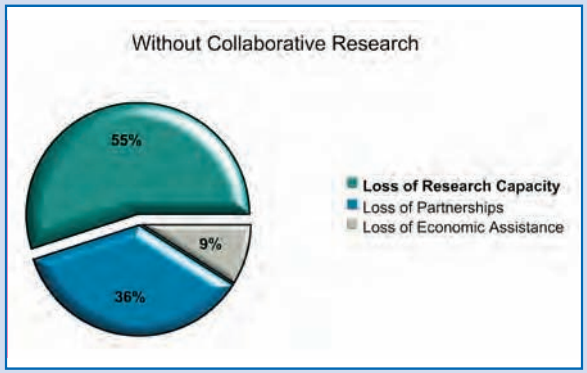
● "I was a fisheries observer right out of college. **The data we collected was sent down to a vault in Florida.** The New England Council didn't see it for five years. I've been grateful to see change over the years and all the collaboration." – *retired fisherman*

● "Study Fleet is a way to get detailed, fundamental information from the fishery. Fishermen have made good suggestions that have helped clean up

Impact Assessment

Interestingly, stakeholder views in the region were focused more on the enhanced communications and relationships that result from collaborative research, than on the economic support. This makes sense given the value of the fisheries here compared to other regions. However, those who participated in the Visioning Project cited the loss of research capacity as the greatest consequence of a loss of funding.





what scientists and programmers developed. Seventeen vessels participate, and we are getting at least 15 more. We are now putting temperature and depth probes on the trawl doors, which fishermen say has saved them money fishing." – *research manager*

- "Before Study Fleet and vessel trip reports, there used to just be port samplers. I never had time to answer their questions as I was unloading the catch. We made so many tows that I could only remember our last tow. That was all the data I gave him. **Study Fleet is much better.**" – *fisherman*

Management Impacts

- "The optimum governance is to have ideas percolate up from the bottom, not have edicts coming from a group or government who has 'perfect knowledge' and knows what everyone should do. **Governments that try to do that go out of business.**" – *fisherman*
- In order for collaborative research data to be looked at more rigorously by managers, one scientist has chosen to focus on getting the work published in peer-reviewed literature, which increases the "paper trail."
- "It takes a long time to get data to impact change. The delays are frustrating. However, there are longer-term indirect impacts. It is hard to interpret why there are so few big groundfish in the trawl survey data, whether we aren't catching what is there, or maybe they just aren't there. Tagging data is being used to examine this. It's an unintended use." – *NOAA scientist*

Partnerships

- "I've been fishing for 47 years, but have been shore-side for the last 14. **Research got me back out on the water** and reconnected with the ocean." – *fisherman*
- "I have worked on scallop video surveys and yellowtail tagging with the industry for four years and have really gotten to know how this fleet operates." – *graduate student*
- "My boats got involved in Study Fleet. It was nice to be on shore and **work with the people from the science world**, who usually just interact with the crew." – *vessel owner*
- "I serve as a liaison between the Portuguese-speaking sector and fisheries science, getting them more involved in research." – *scientist*
- "The best part is the crew learning. It's no longer 'scientist against fishermen,' it's everyone learning together." – *fisherman*
- "Fisheries observers are future scientists. We can build on industry relationships made while observing. They are our future colleagues." – *observer*
- Mass. DMF invited a number of fishermen to go to the Memorial University flume tank to test some of their gear ideas. "We accomplished a communications network where we could all get smarter. **The relationships have snowballed over time.**" – *state scientist*

Importance of Research Funding

- "The limits on Study Fleet are finances, time and training." – *research coordinator*
- "The opportunity to work outside Days-at-Sea was a big factor. It's nice to be able **to contribute to the community**." – *fisherman*

New Ideas/Improvements

- "This is a frustrating time. We have a growing bycatch problem, and the system is not responding to all the innovative gear that has been developed. We are locked into a system that is increasingly sclerotic. Management is too slow for the rate of change that is going on in real time." – *fisherman*
- "As a manager, it's frustrating to have to look at and use the Science Center data, when there might be some other data that is the 'best available.' NOAA reports are so cumbersome, only NOAA can understand them." – *fisherman*
- "From a technical standpoint, you do want clearly defined objectives, but we need to be open to innovative ideas from the industry. **We need to work from both ends.** We need radically different ideas and maybe the industry has them." – *scientist*
- "When I was first on the Council, I introduced a motion that each person who sits on a committee be mandated to make one trip a year to stay connected with the ocean. That idea never flew. We are managing something that is 180 miles away." – *fisherman*
- "It takes months and years to get an experimental fisheries permit, usually costing precious Days-at-Sea. Along with fuel costs and economic stresses, no one can do anything innovative. **The incubator of ideas is drying up as a result.**" – *fisherman*
- "When I started five years ago,

- *"Scientists are taught in the classroom. To get out on the water is revelatory. It's easy to become disconnected very quickly. There is no better way than to do collaborative research."* – *scientist*

none of the mark-recapture or industry-based survey data was in any kind of standardized database. Now, we have data systems that can be Internet accessed. The more fishermen who talk, the more we pay attention to improve things." – *NOAA staffer*

- "As the 'token' young captain here, I'll say it's in all our best interest to **put the past in the past and move forward**. My good friend is a grad student and says it's still ingrained that we are the bad guys." – *fisherman*
- "There needs to be standard data elements. That's where some of the log jams occur to getting science used." – *research manager*
- It was noted that fish caught doing research should be sold, with proceeds going back to research. Because the NEC is university-based, it has set up a process to do this. However, NOAA has more challenges receiving funds.

A Monkfish Fisherman Tests his "Fisherman's Knowledge"

Market conditions sometimes push the industry to fish more selectively than required. That is the case for Capt. Brad Bowen, who has been gillnetting for monkfish with the ***F/V Jessica Marie*** out of New Bedford since 1981. Bowen and his colleagues receive a higher price for larger monkfish. Although the current minimum mesh size for monkfish gillnets is 10 inches, Bowen explains that, "we basically all fish 12-inch mesh anyway, because we don't want to catch smalls."

Capt. Brad Bowen recording data in the wheelhouse.

A few years ago, Bowen came up with a project idea to compare mesh sizes, testing his fisherman's knowledge. He and the Massachusetts Division of Marine Fisheries have been working together ever since on a Monkfish Research-Set-Aside project, Bowen's first involvement in collaborative research. The team has now created a gear mesh selectivity curve, fishing 10-, 12- and 14-inch mesh at different depths. They have found that the 12-inch mesh catches about 74% fewer smalls than the 10-inch mesh. "This is one hard stat to prove why 12-inch is good," beams Bowen. "I got to meet three great scientists, and I already know I have friends for a long time."

State scientist Mike Pol shares Bowen's excitement for the project, but has expressed some concern about the financial risk that Research-Set-Asides require fishermen to take on. "RSAs seem to be a great idea, but Brad had to front much of the equipment costs. It would seem smarter to create a mechanism to receive at least some funding at the start of the project, rather than rely on the price of the catch when the fish are landed to cover the research costs."

Bowen, who has led this project from start to finish, wants to continue collaborating, but is watching the economics of RSAs closely. "Two years ago, when the project was set up, fuel was $2 per gallon and I was getting $1.65 per pound of monkfish," said Bowen. "As I got into the project, fuel went over $4 per gallon and the good quality monkfish was fetching $1.30 per pound."

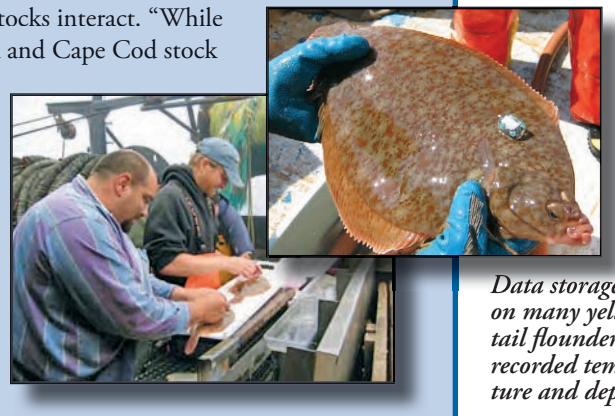
Pol is just finishing up the data analysis, which is consistently showing that the 12-inch mesh has the highest catch ratio of large to smalls. Bowen and Pol are both hopeful that this project will inform future management of the fishery.

Fishermen, Scientists Team Up to Study Yellowtail Flounder

Overharvested and not rebounding, the yellowtail flounder population in New England has become a source of concern. Fishermen are worried for the future of the fishery and are troubled by inconsistencies that have surrounded assessment of flounder stocks.

To address these concerns, fishermen from more than a dozen commercial vessels from Rhode Island to New Hampshire partnered with fisheries scientists to form the Yellowtail Flounder Cooperative Tagging Project. This project, led by Steve Cadrin, director of the UMass Cooperative Marine Education and Research Program, will improve understanding of the yellowtail's age structure and its movement within its range. The study began in 2003 with funding through the Northeast Fisheries Science Center's Stock Assessment Improvement Program. Support has continued through collaborative research grants submitted to the Northeast Consortium and NMFS programs. To date, the project participants have tagged more than 35,000 yellowtail flounder throughout Cape Cod, Georges Bank and southern New England. The information that has been collected is offering important insights into the health, age structure and migration patterns of the yellowtail flounder, information that may be used by fisheries scientists and managers to improve stock assessments.

Yellowtail flounder are managed as three distinct stocks. One of the key questions surrounding yellowtail flounder is how the three stocks interact. "While the Georges Bank and Cape Cod stock components are fairly well documented, the degree of mixing between stocks is not well known," Cadrin explains. "There is little information on how, or how much, yellowtail move between waters off southern New England and the Mid-Atlantic states." Collaborative researcher and N.H. commercial fisherman David Goethel agrees that yellowtail flounder present a puzzle. "The case of Cape Cod yellowtail remains a mystery," he says. Winter flounder and Gulf of Maine cod have experienced recent reductions in fishing mortality, he explains, but "yellowtail mortality has remained high."



Data storage tags on many yellowtail flounder have recorded temperature and depth.

By supplying managers with more accurate information about behavior, independent estimates of mortality, and confirmation of age determinations for each stock, the investigators believe the program will improve management of the yellowtail flounder.

- "A lot of monkfish fishermen I talk with want to participate in the RSA, but they cannot afford to. It is not stable funding and depends on the pounds landed and the price. There is such a small margin of profit in the fishery." – *graduate student*
- "We have had no serious evaluation of what would be a fair and balanced process to be sure fishermen are appropriately compensated while working for an RSA project. **We are locked into a bureaucratic process that we must improve.**" – *research manager*

Building Partnerships and Research Capacity through Collaborative Learning

Fostering a culture of partnership, increasing the dialogue between stakeholders of fishery resources, and developing future participants have been goals of collaborative research funding programs. At the outset of the program, the Advisory Committee of the Northeast Consortium strongly recommended targeted outreach to draw fishermen into collaborative research and into participation in proposal writing by integrating their knowledge with scientific methods.

Several community-based organizations throughout the region have been engaged in generating awareness of funding opportunities, matching fishermen and scientists with similar interests, and reaching diverse fishing sectors and communities from Downeast Maine to Southern New England (e.g., Gulf of Maine Research Institute, Yankee Fishermen's Cooperative, Massachusetts Fishermen's Partnership). Multi-stakeholder teams have written guidelines for proposal development. Topic-specific regional meetings have been convened to share the results of research and explore future avenues of inquiry. Workshops in a variety of settings and for a variety of stakeholders have provided education on marine resources, policy and management, and fishing operations.

Left to right, collaborative research projects have focused on adapting commercial nets for ecosystem studies, tracking female lobsters and classifying seafloor habitats.

Training the Next Generation: Students and Crew

Institutions involving students in collaborative research in the Gulf of Maine and Georges Bank include:

Maine
Bigelow Laboratory for Ocean Sciences
University of Maine
University of New England
University of Southern Maine

New Hampshire
University of New Hampshire

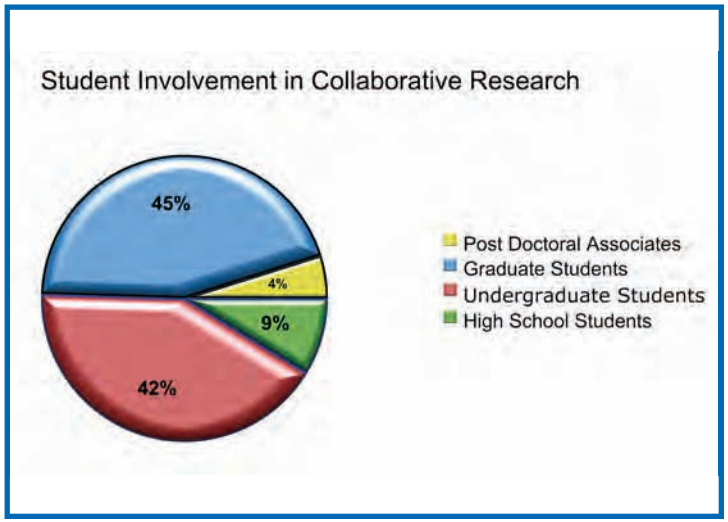
Massachusetts
Boston University
Clark University
Harvard University
Northeastern University
UMass Dartmouth
UMass School of Marine Science

Other States
Duke University
Rutgers University
University of Maryland
University of Rhode Island
University of Ulster (Ireland)

Collaborative research engages others besides seasoned scientists and captains. The success of many research projects depends on the participation of crew members and students. Giving opportunities to participate in collaborative research to a broad spectrum of people strengthens the collaborative process and the upcoming generation of researchers.

Students, interns and crew aboard the **F/V Hannah Boden.**

The participation of students and crew has been significant. Over 100 students have participated in Northeast Consortium research, and at least one crew member aboard most of the over 500 vessels involved has participated to date. Perhaps the largest group of fisheries students in the Northeast, about 50 at present, is at the University of Massachusetts School of Marine Science. All of them are required to have a collab-



● *"I have two thesis advisors, my professor and the fisherman I go to sea with." – grad student*

orative component to their training.

Stakeholders at the Visioning meetings spoke of the importance of including students and crew in research:

● "Who is going to do collaborative research when we are gone? It's the students and crew members. Collaborative research based in academic settings fosters future science participants." – *collaborative research program staffer*

● "It was good for my crew to have strangers come and go on the boat. My mate was a real old timer and didn't want to do a good job, but it didn't take long for him to catch on." – *fisherman*

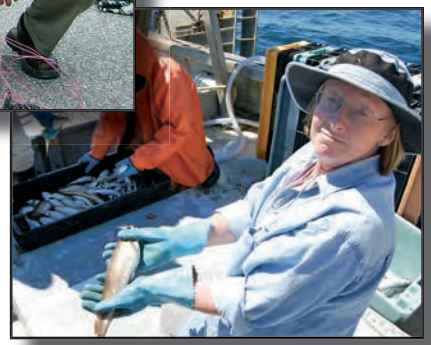
Students and crew are trained to collaborate.

Fishermen Training Non-fishermen

Fisheries management in the U.S. has become very complicated. Restrictions on fishing gear and operations are now key components of fisheries management plans. At the same time, people with no fishing gear background are increasingly involved in fisheries management and, while they have strengths in their respective professions, this lack of operational knowledge can make their jobs more difficult and their decisions off the mark.

These kinds of gaps are now being filled through several collaborative learning workshops. One is the "Fishing Gear Workshop for Non-fishermen," a N.H. Sea Grant project funded by the Northeast Consortium and the National Marine Fisheries Service Northeast Region's Cooperative Research Partners Program (CRPP).

The project employs commercial fishermen as instructors, a reverse-training strategy that helps build mutual understanding between groups that are usually at odds. Adding another element of reality to the project, commercial trawlers and gillnetters owned and operated by fishermen serve as at-sea workshop platforms for two days of demonstrations. Since 2004, some 59 participants, including congressional and senatorial staffers, state and government regulators, and marine educators have participated in the workshop.



Fishermen teach non-fishermen how to rig gear and handle other daily boat operations.

"As fishermen, we have a personal responsibility to be stewards of the resource and educate those who regulate in all of the state and government managed fisheries," explained Billy Keefe, a commercial gillnet fisherman and workshop instructor. "In doing so, it allows another tool, some insight and a humanizing of all those affected by their decisions in any and future regulations. I had become an educator, instructor and answer man to VIPs with long lists of accolades following their names. Their suits, ties and formal professional attire had been abandoned and replaced with plain clothes, backpacks, sunglasses and sun block as they stepped onto and into my classroom."

"As fishermen, we have a personal responsibility to be stewards of the resource and educate those who regulate in all of the state and government managed fisheries." — Billy Keefe, commercial fisherman

MREP Educates and Empowers Stakeholders

At each of the eight Visioning meetings, the Marine Resources Education Project (MREP) was cited as not only increasing knowledge of fisheries science and the management process, but also building bridges between different stakeholder groups. Since the spring of 2002, MREP has held a total of 12 six-day courses, one every six months, involving over 300 marine resource professionals, including over 190 commercial fishermen.

A MREP class listens to Phil Haring of NOAA discuss the Council process. Above, industry advocate John Williamson and scientist Chris Glass collaborate on an exercise.

"One of the most valuable things about MREP is the collaborative planning group," says Mimi Becker, a professor in the Natural Resources Department at the University of New Hampshire and the original project leader of MREP. From its beginnings, the project was developed and guided by a diverse board of directors, including representatives from several sectors of the fishing fleet, scientists and an advisor from the NOAA Fisheries Northeast Regional office.

From 2002 to 2005, MREP was based at UNH and funded solely by the Northeast Consortium. Over the past few years, MREP has expanded its funding base (e.g., CRPP, MARFIN) and its administration has shifted to the Gulf of Maine Research Institute.

Meredith Mendelson coordinates MREP today. She cites the empowerment of the industry as one of its greatest impacts. "Fishery council staff comment that fishermen who have taken the MREP program are much more effective when they come to the microphone to speak. Knowledgeable fishermen have greater influence."

Here is some of what others said about MREP at the Visioning meetings:

- "My career in collaborative research started by doing the MREP program. On the first day, people were a bit adversarial, but as people got to know each other and think together about solutions, a lot of preconceived notions fell away." – *research facilitator*
- "A woman I thought was the Wicked Witch of the West was in a focus group with me. By the end, she was one of my best friends. MREP is a format to work things out. There was hope." – *fisherman*
- "I was in a lethargic state in my fisheries politics career. It was Mimi Becker who motivated and rejuvenated me. Now, I'm on about everything that's going on." – *retired fisherman*
- "MREP improved my understanding of fishermen's concerns, how their gear works, and the research questions they have in a way that talking with my science peers does not achieve." – *scientist*
- "I was apolitical and tried to outsmart the government for at least a decade. I'd never gone to a meeting; I didn't want to. I was adamantly against it. I had a 'micro' perspective, but MREP gave me a 'macro' perspective. I was a facilitator of the last MREP. We had guys that were just like I was." – *fisherman*

Federally managed fisheries, particularly groundfish, have traditionally been the focus of the MREP workshops, and thus they have attracted primarily stakeholders associated with groundfish. Few fishermen east of Rockland,

Maine, have participated to date. That was evidenced at the Visioning meeting held in Machias, where only one of the 15 attendees had ever heard of MREP. This fishermen indicated, "I was asked to take the course and now I help teach it as a 'industry translator.' They want to be sure fishermen really get it."

Stakeholders throughout the Gulf of Maine see the value of MREP and wish that it, or MREP-like programs, could expand to other fisheries and to other regions. In fact, members of the South Atlantic Fishery Management Council audited MREP in 2006 with the intent of starting a similar program in Florida. There is interest in replicating MREP in other regions, and those opportunities are currently being explored. The program is also considering creating additional courses for MREP alumni.

Fishing Gear Workshop Brings U.S. Fishermen to Newfoundland

Following the dramatic decline in Gulf of Maine and Georges Bank fish stocks during the early 1990s, fishermen have faced a daunting list of regulations that have dictated the gear they can use, the number of days they can fish, and even how much fish they can land. To preserve fishing as a means to make a living, many fishermen have evolved into innovative collaborators with university scientists all along the New England coastline. As with any change, this did not occur "overnight" and took the efforts of both science and industry to take the time to come together and discuss potential solutions to a laundry list of problems within the Gulf of Maine fisheries.

Pingguo He, fishing gear scientist at the University of New Hampshire, saw an opportunity to bring fishermen together with conservation engineers and fishery regulators, while at the same time providing an education on the fundamentals of gear technology. In 2001, He began bringing fishermen and fishery stakeholders to Memorial University in Newfoundland for several days of intensive instruction on fish behavior and fishing gear design. Using the world's largest flume tank (8m wide x 4m deep x 22.25m long), engineered scale models of mobile fishing gear were viewed in action. Participants were able to see how their fishing gear behaved under different configurations. "By bringing such a diverse group together we were able to open up and strengthen lines of communication between fishermen, scientists and gear technologists," He explained.

From 2001 to 2006, the workshops provided 72 fishing industry participants, scientists, extension specialists and environmental groups opportunities to upgrade their knowledge on trawl design and operation and to acquire techniques on selective gear designs and conservation concepts.

A group of fishermen and scientists pose in front of the world's largest flume tank, which is located at Memorial University in Newfoundland.

The workshops have been very successful and have resulted in many collaborative research projects later funded by both the Northeast Consortium and NOAA's Northeast Cooperative Research Partners Program. The success in part has been the result of increasing opportunities for industry and science to come together and discuss important issues, as well as the longstanding relationships that have been sustained.

- "Research has helped me think, 'what can we do,' not, 'what can you do to help me.'"
– *fisherman*

- "The data sharing benefit of collaboration is huge. It starts with establishing relationships and trust between people."
– *research facilitator*

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