



Maine Sea Grant College Program
ANNUAL REPORT 2004



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Maine Sea Grant College Program
Annual Report 2004

This annual report summarizes the accomplishments and activities of the Maine Sea Grant College Program from October 1, 2003, to September 30, 2004. We have organized the report by program areas: management, research, extension, education, and communications. The projects and activities in the marine extension section are grouped according to our four theme areas: ecosystem health, coastal communities, fisheries, and aquaculture. If you have any questions about the Maine Sea Grant Program, please contact one of our staff members listed at the end of the report, or visit our Web site at: www.seagrant.umaine.edu.

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Maine Sea Grant College Program Annual Report 2004

Table of Contents

A Message from the Director	p.2
Management	p.3
Research	p.6
Marine Extension	p.11
Ecosystem health	p.12
Coastal communities	p.14
Fisheries	p.16
Aquaculture	p.18
Education	p.19
Communications	p.23
Board/ Committee Participation	p.26
Scientific Publications	p.28
Peer-reviewed articles/books	p.28
Published abstracts	p.29
Graduate Students	p.30
Theses/ fellowships	p.30
External Grant Awards	p.31
Program Development Awards	p.32
Research projects	p.32
Conference support	p.33
Maine Sea Grant Staff	p.34
Policy Advisory Committee	p.35

A MESSAGE FROM THE DIRECTOR

When I arrived at Maine Sea Grant at the end of 1999, the first thing the program did was to purchase a book on developing strategic plans. Thus began the yearlong effort that created the strategic plan, *Marine Science for Maine People*, which Maine Sea Grant is currently implementing. Anyone who has participated in strategic planning knows that, if done correctly, it is not easy or fun. It is now time for our program to begin developing the next strategic plan that will describe our program goals, objectives, and anticipated outcomes for the four-year period beginning in 2006. Before launching into this Herculean effort, it is important that we assess our progress on the current plan, and determine where we have succeeded and where we may have come up short.



Through our implementation planning over the past several years, we have come up with some ways of quantifying the obvious measures. These include the contacts we have made with the public, the scientific community, and other stakeholders as they apply for grants, request publications, or ask for assistance and information. Still, these measures fail to provide any sense of the value of our program in solving problems related to marine and coastal issues, or changes in human behavior that might be occurring because of our efforts to inform and educate.

So how do we know that we are accomplishing anything meaningful? As our program has developed over the last few years, and the Marine Extension Team has matured, we have enjoyed an increasing number of relationships with people and organizations throughout the state of Maine. Some examples of these relationships can be seen in the list of boards and committees on which our staff participates found on page 26 of this report. These relationships are part of our success and tend to lead to partnerships and projects that, by their collaborative nature, are high impact.

Of course we will strive to identify the best measures of success for each component of our program, as we develop the next strategic and implementation plans for Maine Sea Grant. Over the next several months, we will be contacting clients and stakeholders throughout the state to solicit input as we craft these new plans. But the factor that really makes our program work is the interactions we have through meaningful relationships with you and the many other clients with whom we have regular contact. Through these relationships, we learn more about the needs of our society and how we fit into the broader picture. In these busy times, it is challenging to maintain quality relationships, but this is perhaps the most important professional and personal accomplishment we can have.

Thank you for taking the time to review this annual report for Maine Sea Grant. We look forward to hearing from you and finding out how we can contribute more fully to our relationship with you and others in our coastal communities.

A handwritten signature in black ink, appearing to read "A. S. Edson". The signature is fluid and cursive.

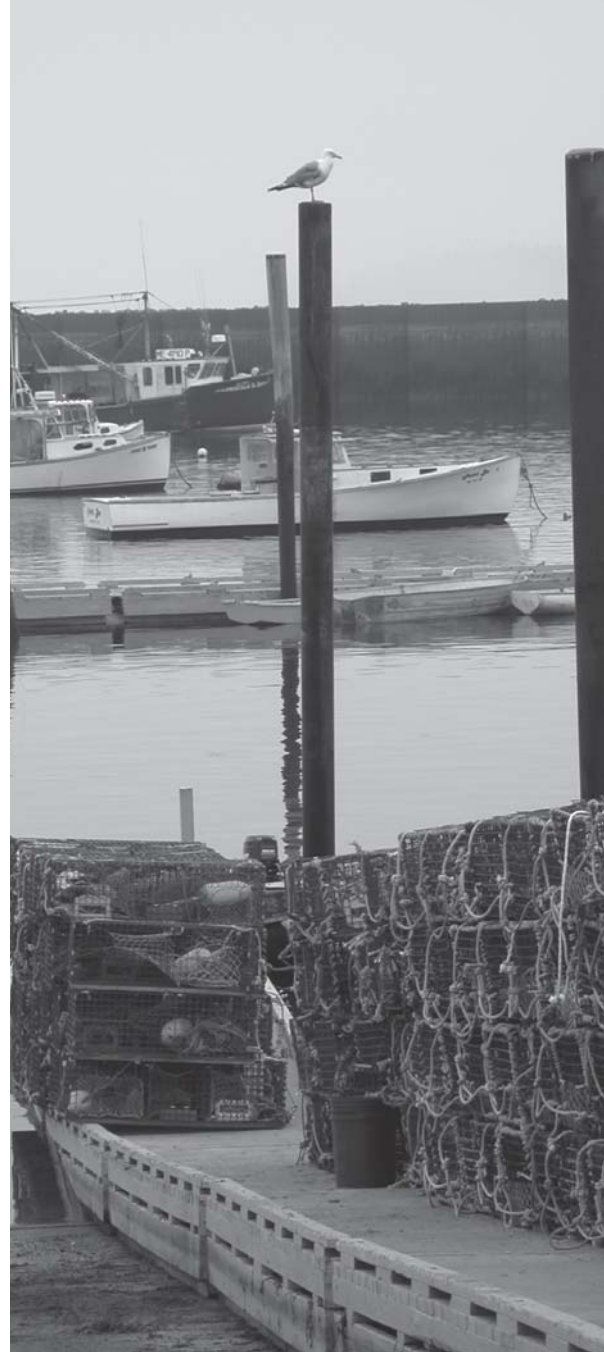
MANAGEMENT

In the fall of 2003, a team of national experts and members of the National Sea Grant Review Panel visited the University of Maine to determine if the University should be designated a Sea Grant College. The review was very successful and on May 27, 2004, the University of Maine was formally designated a Sea Grant College during a celebration held at the University of Maine campus in Orono. Ted Kassinger, Deputy Secretary of Commerce designate, presented the award to University President Peter Hoff. This event reaffirms the commitment of the University of Maine to marine science and validates the many years of successful programming by Maine Sea Grant. The designation as a Sea Grant College acknowledges the capabilities and competitiveness of the Maine Sea Grant Program, the University of Maine research community, and the state.

Maine Sea Grant's management team includes: Paul Anderson, director (who also serves as extension program leader); Susan White, assistant director for communications; Jim McCleave, assistant director for research; and Lynn Wardwell, fiscal officer. This group meets regularly and continues to manage the program collaboratively, and all decisions about staffing and project selection are shared among the team. Kathy Villarreal, administrative assistant, supports the work of the team. Within our office, we have also reorganized the communications program. Under the leadership of Communications Coordinator Susan White, we now have a four-member team in the communications department including: Catherine Schmitt, science writer; Cheryl Daigle, science publications designer; and Jennifer Peters, information technology coordinator and Web designer.

This year, Maine Sea Grant created a fourth theme to supplement the other three used to categorize our programming over the past several years. In addition to Ecosystem Health, Fisheries, and Aquaculture, we now use Coastal Communities as a theme for organizing and discussing our programmatic initiatives. We have several new initiatives over the past year that fit nicely into the Coastal Communities theme, including nature-based tourism, coastal access, Nonpoint Education for Municipal Officials (NEMO), marine bioinvasions, and monitoring impacts of recreational use on coastal islands.

Another new initiative that is beginning at the end of the 2004 cycle is programming by Extension Associate Tracy Hart to help the state evaluate the role of marine protected areas (MPAs) in fisheries management. Funded by National Sea Grant through the competitive Fisheries Extension Enhancement program, this five-year project will ensure that all affected parties in the state are informed and included in discussions about whether MPAs should be designated in the Gulf of Maine and for what purposes.



The establishment of the University of Maine's Sea Grant College Program is yet another benchmark in an outstanding track record.

- Navy Vice Admiral Conrad C. Lautenbacher

Regular visitors to the Maine Sea Grant Web site (www.seagrants.umaine.edu) will notice that the site has undergone a complete overhaul in recent months. The site was redesigned to be more user-friendly, to meet ADA requirements, and to allow for expansion into new Internet-based tools in the future. We anticipate using the site in the coming years for more information gathering from stakeholders and scientists, and as a mechanism for simplifying the grant submission and review processes.

The Governor's Task Force on the Planning and Development of Marine Aquaculture in Maine, chaired by Maine Sea Grant Director Paul Anderson, completed its six-month fact-finding and delivered its report to Governor Baldacci and the Joint Legislative Committee on Marine Resources in early 2004. The report included over 95 recommendations for statutory and regulatory changes, as well as policy suggestions for the regulatory agencies and the industry. With this intensive review and the information collected, Maine Sea Grant can develop more strategic efforts in research, education, and extension related to the marine aquaculture sector, as we assist in the development of sustainable aquaculture in Maine. One of the recommendations from the governor's task force was to charge the Land and Water Resource Council of Maine to further investigate the concept of bay management for guiding decision making on coastal natural resources and human uses. Anderson is now serving on a working group to help with this effort over the next two years.

The Maine Sea Grant Program has worked very closely with other Sea Grant programs in the Northeast region on commercial fisheries activities over the past few years. This year, we made progress in enhancing our relationships with various industry partners and the fisheries management agencies in the region. It is challenging for a non-regulatory organization, such as Sea Grant, to partner with regulatory agencies, but this year we participated in several joint efforts with NOAA Fisheries, the New England Fisheries Management Council, and the Atlantic States Marine Fisheries Commission. By providing facilitation and planning support to efforts related to bycatch and endangered species, we have

provided an important service to these collaborators on difficult issues.

Beginning with the 2006-2007 funding year, Maine Sea Grant will go to a biannual call for proposals for Sea Grant-sponsored research. Up until now, Maine Sea Grant has conducted annual competitions for research funds, but we have found this to be inefficient, as the pool of available funds has remained constant and the cost of conducting research has increased. Although this limits our responsiveness, we hope that we continue to attract high caliber proposals that address timely needs for scientific research.

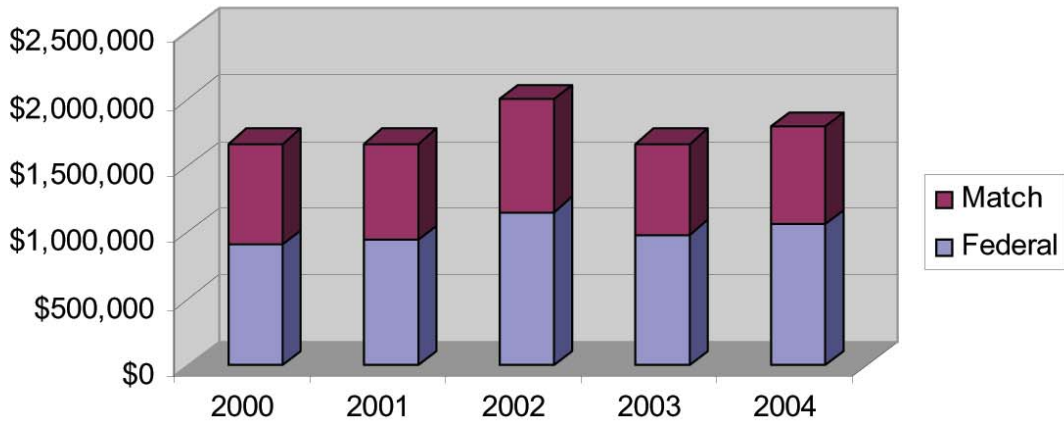
Funding and Budget

The overall funding for Maine Sea Grant in 2003-2004 was \$1,798,023, with \$1,056,142 in federal funds and \$741,881 in non-federal matching funds (Figure 1). The federal award includes base funds, Fisheries Extension Enhancement, Coastal Community Development, Smart Growth, and researcher ship time funds. Matching funds are derived from a combination of University of Maine resources (including the Maine Economic Improvement Fund) and match provided by host institutions that received research awards from Maine Sea Grant.

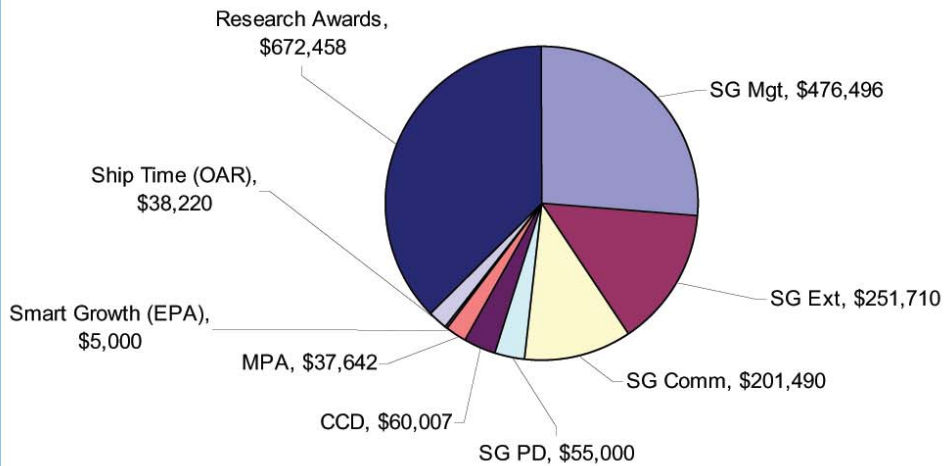
Maine Sea Grant continues to comply with the National Sea Grant Office guidance suggesting that at least 50% of the program's federal base, plus merit funds (\$987,500), be allocated to competitive proposals in research and education. Figure 2 shows the Maine Sea Grant budget for 2003-2004, indicating how federal funds and matching funds were allocated to various program elements. As indicated in the graphic, \$727,458 (Research and Program Development) of these funds supported competitive research projects in 2003-2004. The balance of the program budget covered extension/education (\$251,710), communications (\$201,490), management (\$476,496), Coastal Community Development (\$60,007), Marine Protected Area extension work (\$37,642), Smart Growth Program (\$5,000), and researcher ship time (\$38,220).

Funding and Budget

Figure 1: Maine Sea Grant Funding (2000-2004)



**Figure 2: Maine Sea Grant Budget - 2004
Total - \$1,798,023**





RESEARCH

Research sponsored by the Maine Sea Grant College Program focuses on the themes identified in the current strategic plan: aquaculture, ecosystem health, and fisheries. Using a pre-proposal review panel of in-state stakeholders assures that Maine Sea Grant funds research that is relevant to the needs of Maine's coastal communities, whether the impacts are immediate or evolve over the long term. Often the importance of the research extends to the Northeast/Maritime Provinces region, the Gulf of Maine, and beyond. Using out-of-state full proposal reviewers and review panel members assures that high quality research is supported.

Nine research projects were under way in 2004.

Aquaculture

- Bowdoin College marine biologists are examining ways, such as using artificial feed, to increase the growth rate of green sea urchins (*Strongylocentrotus droebachiensis*) for aquaculture or reseeding projects. Although urchins fed urchin chow grew faster than those fed salmon chow, the researchers predicted that the urchins still would require three to six years to grow to harvestable size. Additional methods, such as manipulating temperature, may be needed to increase urchin growth rates and improve marketability of the resource.
- University of Maine and University of Connecticut marine biologists are working together to determine whether some complexities in the life cycle of Maine seaweeds (*Porphyra species*) can be manipulated to achieve ease of production in mixed-species aquaculture. Maine *Porphyra* species are difficult to identify morphologically, and are similar to an Asian species that leads the market. Preliminary tests suggest that the native species are equally tasty, and may be developed via aquaculture into new food products.

Ecosystem Health

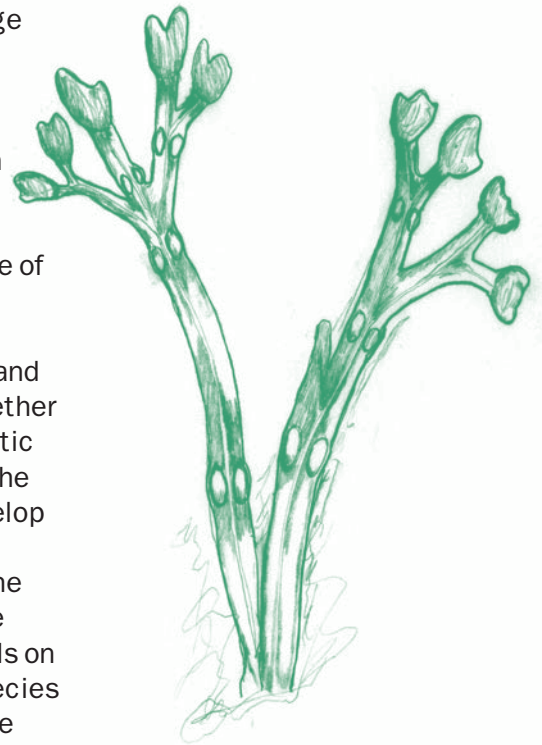
- University of Maine and Maine Geological Survey marine geologists are collaborating to study natural beach and shoreline changes in Saco Bay, as well as sand transport caused by jetty construction and artificial beach nourishment.
- An engineer at Texas A&M University at Galveston is developing a wave atlas and a computerized wave prediction system for the coastal Gulf of Maine. Using the SWAN model (Simulation of Waves in Nearshore), 48-hour wave forecasts with 0.5 km resolution will be produced for seven domains covering the area from Massachusetts Bay to the Canadian border. Ultimately, updated forecasts will be available on the web. Forecasts for Penobscot Bay and Machias Bay regions can be seen by following the links at www.tamug.edu/mase/wave_file/wave%20simulations.htm.

Fisheries

- A University of Maine economist, one of many scientists contributing to the development of co-management and other forms of decentralized fisheries management in Maine, is assessing the effectiveness of municipal-level management of soft-shell clams (*Mya arenaria*) in Casco Bay.

Aquaculture is becoming a significant area of Sea Grant-sponsored research.

- Another group of University of Maine scientists is developing an agent-based (“bottom-up”) model of the American lobster (*Homarus americanus*) fishery, which has used co-management since 1995. The model attempts to simulate the trap placement decisions of a large number of lobstermen, with the goal of identifying factors that have contributed to the unexpected abundance of lobsters in Maine.
- Two marine scientists at the Gulf of Maine Research Institute are quantifying the amount of herring bait that is consumed by American lobsters and determining the proportion of lobster diet and tissue production (growth) derived from herring bait. Their findings indicate that herring bait is an important subsidy to lobsters, but the influence of herring bait on lobster population size is still unknown.
- A University of Maine marine biologist is determining whether sea scallop (*Placopecten magellanicus*) populations in Cobscook Bay and Penobscot Bay are isolated and constitute separate stocks or whether they are seeded by a common source of juveniles. Molecular genetic techniques will determine gene flow between the two areas, and the chemistry of the shells will determine whether early juveniles develop within each bay or outside of the bays.
- A team of biological oceanographers and fishery biologists from the University of Maine, the University of Southern Maine, and the Maine Department of Marine Resources are studying environmental controls on the recruitment of northern pink shrimp (*Pandalus borealis*), a species whose population size fluctuates dramatically. The team is testing the hypothesis that recruitment success of shrimp is related to the timing and intensity of the winter-spring phytoplankton bloom.



Three recently completed projects are highlighted below.

Seaweed harvesting in Maine: evolving laws to meet an evolving industry: \$10,490 (2002-2003)

Seaweeds have been harvested in the intertidal and subtidal zones along the coast of Maine for hundreds of years. Traditionally, seaweeds were used as fertilizer and as livestock food. Contemporary uses of seaweeds include food products, such as ice cream, frosting, and salad dressing; cosmetics and hygiene products, such as toothpaste; pharmaceuticals; and industrial products, such as paper coatings, growth media for microbiology, adhesives, fabric sizing and printing, paint, insulation, and fertilizer components. Because of the value added in contemporary uses, interest in seaweed harvesting along the coast has increased in recent years. About a dozen species are harvested along the Maine coast, primarily

knotted wrack (or rockweed, *Ascophyllum nodosum*), bladder wrack (*Fucus vesiculosus*), Irish moss (*Chondrus crispus*), and dulce (*Palmaria palmata*).

Conflict has arisen, and the potential for increased conflict exists, among seaweed harvesters, shorefront property owners, and marine resource managers. The conflict stems directly from a quirk in Maine’s property laws dating back to the Massachusetts Colonial Ordinance of 1641-1647. In a recently completed project, John Duff and graduate student Mitchell Feeny, of the Marine Law Institute of the University of Maine School of Law, explored (1) legal conflicts and public policy issues facing law makers, private property owners, marine resource managers, and seaweed harvesters, and (2) the current statutory and regulatory regime applied to seaweed harvesting in the context of a property rights legal framework. In a nutshell, who owns the seaweed?

The Massachusetts Ordinance gave shorefront property owners title to the land down to the mean low tide line. This ordinance became part of Maine law when Maine separated from Massachusetts. In other states, ownership ends at the mean high tide line. The ordinance does give rights to others for “fishing, fowling, or navigation” in the intertidal zone, but does not give the right to cross private property to reach the intertidal zone. The definition of fishing has been legally extended to include clam and worm digging and the taking of shellfish, but not seaweed harvesting.

Ownership of the seaweed is claimed by some property owners on the grounds that they have the right to take a profit from the soil, much as they have the right to harvest timber from their land. In the 1861 case of *Hill v. Lord*, the Maine Supreme Judicial Court ruled in favor of the property owner, declaring that seaweed belonged to the owner of the soil. However, phycologists now know that seaweeds use a holdfast rather than roots to anchor to the substrate, and obtain nutrients from the water column, not from the soil, leading harvesters to claim that the taking of seaweed is “fishing.” Marine resource managers are concerned with conserving seaweeds since they are important ecological resources, providing shelter for juvenile lobsters and numerous species of juvenile fishes.

In 1999, the Maine Legislature enacted legislation requiring seaweed harvesters to possess a permit to be issued by the Department of Marine Resources (DMR) and empowered the DMR commissioner to adopt rules regulating seaweed harvest. Some

legislators have argued that DMR should not be issuing such permits because they do not have the right to regulate what is privately owned. Clouding the issue further is the question of whether a permit is required from the Maine Department of Environmental Protection (DEP) prior to removing vegetation if material can wash into a coastal wetland. The DEP has not used its apparent authority in this case.

Feeney concludes that the laws regulating seaweed harvest need an overhaul. He says that the problems surrounding Maine’s seaweed resource include illegal taking of private property (DMR permit notwithstanding), lack of regulation to prevent overharvesting, and lack of enforcement of the few regulations now in place. Duff adds that neither the landowners nor the harvesters seem willing to risk a court battle over ownership.

Molecular genetic characterization of blue mussel populations in the Gulf of Maine: \$79,993 (2000-2003)

The blue mussel, *Mytilus edulis*, is a common rocky intertidal and subtidal bivalve mollusk, which is harvested in the wild and grown in aquaculture in the northeastern United States and Atlantic Canada. Landings of blue mussels in Maine in 2003 were about 4.3 million pounds of meats (i.e., without shells) with a value of about \$4.5 million. Aquaculture is contributing an increasing proportion of the blue mussel harvest in Maine, and the industry is moving from culture on the sea bottom

to culture below floating rafts. Suspended raft culture is more efficient and produces a superior product.

A second blue mussel species, *Mytilus trossulus*, occurs mixed with *M. edulis* in Newfoundland and Nova Scotia. It was found in the Bay of Fundy in the mid-1990s, providing the first evidence of its

Researchers work to resolve conflicts arising over seaweed harvesting.

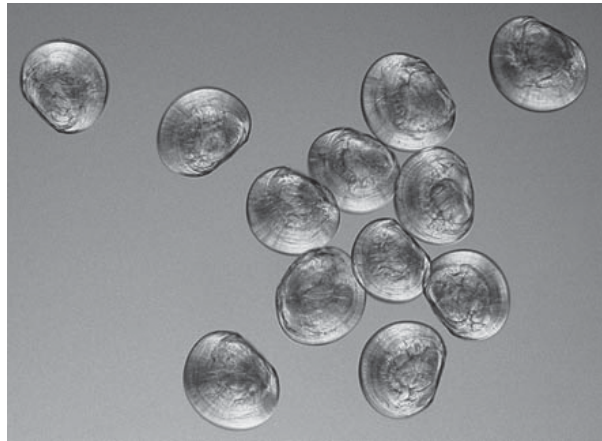


presence in the Gulf of Maine. The presence of *M. trossulus* in waters near Maine has raised concerns in the aquaculture industry because (1) culture facilities seed their beds or rafts with wild spat (settling juveniles), and (2) *M. trossulus* is considered an inferior species. *Mytilus edulis* produces more meat per individual and has a more robust shell, which

reduces damage during processing. The economic value of *M. edulis* may be 1.7 times greater than that of *M. trossulus*.

Paul Rawson and graduate students Susan Hayhurst, Matthew Gordon, and Susan Limbeck recently completed a project investigating the presence of *M. trossulus* in Maine coastal waters. Initially, they extracted nuclear and mitochondrial DNA from 518 mussels from 11 locations along the Maine coast from Cobscook Bay, near the Canadian border, to mid-coast Maine. Analysis indicated that *M. trossulus* was present with frequencies of 34% to 97% at the seven easternmost sites, and dropped precipitously west of those sites (less than 5%). Then four additional sites were sampled in the area of low incidence of *M. trossulus*, and three sites were sampled at increasing distances from the coast. These seven sites bracketed the location where nearly all of the spat is collected for transport to various aquaculture sites in Maine. The additional coastal sites had low incidence (less than 10%), but moving offshore the incidence increased from 25% to more than 50%. This showed that, fortunately, spat is being collected in an area dominated by *M. edulis*, but high densities of *M. trossulus* are found nearby in offshore waters.

In addition, Rawson and his colleagues found that hybrids occur between the two mussel species in Maine. About 13% of more than 300 mussels examined contained genetic markers from both species, indicating hybridization, but few were first generation hybrids. Laboratory experiments documented a high degree of gamete incompatibility between the species.



A research team is investigating whether the more economically valuable blue mussel species can co-exist with an inferior species.

Preliminary results from Rawson's research suggest that the different spatial pattern of settlement is due to a lower tolerance of *M. trossulus* for warm water during the summer settlement period. This is in contrast to previous suggestions that *M. edulis* is less tolerant of low salinity or that the two differ in tolerance to wave exposure. Rawson's research is now examining the factors that control the distribution of *M. trossulus* in the Gulf of Maine to predict how the species composition might change in the future.

Developing a Bayesian stock assessment framework for the American lobster (*Homarus americanus*): \$130,848 (2002-2004)

The American lobster supports the most valuable commercial fishery in the northeastern United States. Most of the lobster landings occur in Maine, where the estimated landings in 2003 were 55 million pounds valued at \$205 million. More than twice as much American lobster is landed in Maine than in all other states combined. Several previous assessments of the lobster stock in the Gulf of Maine have suggested that the stock has been overexploited for the past 20 years and vulnerable to collapse, despite the fact that landings have generally increased over the period. However, recruitment to the fishery, total potential egg production, and stock abundance have increased over that time. A lack of industry support for current stock assessments creates friction among scientists, industry, and managers, driving

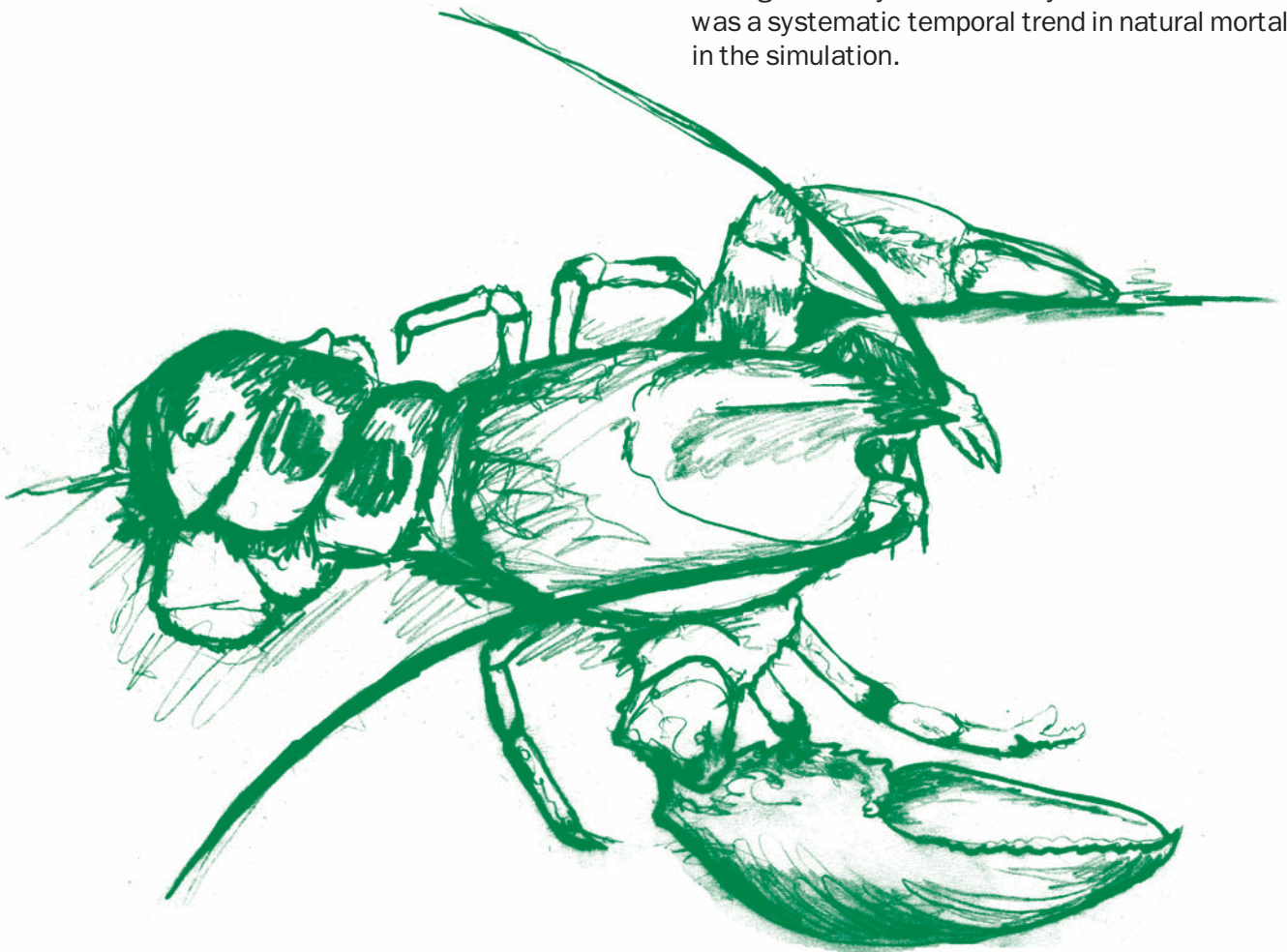
the need for new, alternative approaches to assessing lobster stocks.

Yong Chen, postdoctoral associate Minoru Kanaiwa, Maine Department of Marine Resources lobster biologist Carl Wilson, and several graduate students have completed the development of a size-structured Bayesian stock assessment framework. The advantage of this approach is the ability to incorporate prior knowledge of fisheries and data from different sources, and to yield results that can be used directly for risk analyses of alternative management strategies. A critical component is the development and testing of a length-structured population model describing the dynamics of the lobster population and lobster fishery.

The population model developed by Chen and colleagues incorporates sub-models for growth and molting, number-at-length, survival, and recruitment, with input data from fishery-dependent

and fishery-independent sources. The population model provides estimates of legal-sized lobster abundance and biomass, catch per unit effort in numbers and in biomass, and size composition of the catch. Working with the Atlantic States Marine Fisheries Commission's Lobster Stock Assessment Subcommittee and Lobster Model Development Subcommittee, they developed an individual-based lobster simulator for the lobster fishery and tested the performance of the model under a variety of simulation scenarios with different errors in data and different recruitment dynamics. For each simulation scenario, the key population and fisheries parameter estimates were compared with the true population and fishery parameters built into the simulation.

Chen concluded that the length-structured population model tended to be robust under a variety of conditions, but estimates tended to have errors when fishing mortality was suddenly doubled or when there was a systematic temporal trend in natural mortality in the simulation.



MARINE EXTENSION

Maine's Marine Extension Team (MET), a collaboration of University of Maine Cooperative Extension and Sea Grant, includes five Sea Grant extension associates, four Cooperative Extension faculty and professional members, and the marine extension program leader. The team works with resource users and communities to address problems and respond to opportunities in ecosystem health, coastal communities, aquaculture, and fisheries. By providing a balanced approach to facilitation and building collaborations, extension staff help decision-makers and stakeholders identify information needs and foster opportunities to fill those data gaps.

Marine extension staff members are an important link between the state's marine scientists and information users. Working with the University and other marine science institutions in the state, MET members disseminate research results to address the needs of coastal communities. In addition to providing scientific information, the MET conducts outreach programs and facilitates discussions to obtain input from the state's citizens. Through these processes, communities and other stakeholders gain the capacity to make informed decisions about the management of coastal and marine resources.

In the past year, this dynamic team has been involved in projects that run the gamut—from fisheries gear technology and aquaculture demonstration projects to ecotourism, coastal access, and habitat restoration efforts. Statewide programs in water quality and phytoplankton monitoring, beach profiling, and recreational island/intertidal zone monitoring use volunteers and work in collaboration with coastal communities and state agencies, while aquaculture and fisheries programs involve applied research and facilitation efforts.

We have chosen projects on the following pages to highlight some of our accomplishments in the past year.



*Members of Maine's
Marine Extension Team,
stationed along the coast from
Wells to Eastport, are the link
between marine scientists and
information users.*

ECOSYSTEM HEALTH

Marine and coastal ecosystem health issues in Maine are complex, multidisciplinary, dynamic, and cover a large geographical area. A key component of the Marine Extension Team's work is facilitating citizen involvement in monitoring and managing coastal resources. Staff members lead outreach programs in water quality, phytoplankton, island, beach and salt marsh monitoring; nonpoint source pollution; and watershed education. Staff members also provide and support educational forums on topics related to the health of the Gulf of Maine, and participate in efforts to develop an assessment of ecosystem health and standardized methods for tracking this health over time.

Beach Profile Monitoring data available online

Volunteers in the Beach Profile Monitoring Program measure the erosion and accretion of sand on southern Maine beaches. The collected information is used to create a long-term picture of coastal processes on the state's sandy beaches. In fall 2004, an online data entry system became operational that makes five years of profiling data from 15 beaches available for analysis and interpretation to the Maine Geological Survey, the University of Maine, coastal municipalities, and the interested public. The system will allow volunteers to enter monthly profiling data directly into a master database; the data can then be used to generate a graphic representation of the change that has taken place at a specific beach or over a specific period of time.

Forum initiates statewide discussion on marine invasive species

Also known as bioinvaders or nuisance species, marine invasive species are plants, animals, and other organisms introduced from other regions that spread in their new environment to the extent that they overtake native species and their habitats. Marine invasive species can cause significant economic and ecological impacts, and create a challenge for marine managers. In May 2004, Maine Sea Grant and the Casco Bay Estuary Project hosted *Maine's Marine Invasion*, a forum designed to raise public awareness of bioinvaders that threaten Maine's marine environment and to energize further collaboration on marine invasive species monitoring, research, management, and education. The forum, which

drew 115 participants, was the first step in developing a statewide strategy for addressing marine invasive species issues in Maine, and a working group has formed to continue the effort. MET member Tracy Hart and Maine Sea Grant Director Paul Anderson, are members of the working group.

Participation in Healthy Coastal Beaches expands to 17 towns and 37 beaches

Polluted coastal bathing beaches can pose a potential public health risk if bacterial contamination is present. Municipalities, state parks, and volunteer groups in the Maine Healthy Coastal Beaches (HCB) program systematically monitor coastal swim beach water quality and provide public notification of unhealthy conditions. An online database has also provided the U.S. Environmental Protection Agency, towns, and state park officials with immediate access to water monitoring data, allowing them to make decisions about posting advisories more efficiently.

Under the leadership of MET member Esperanza Stancioff, the Healthy Coastal Beaches program has developed an extensive public information



MET members are working to raise public awareness of the Asian shore crab (left) and other marine invasive species.

The MET is leading the effort to monitor recreational use of islands and assess impacts on intertidal areas.

campaign during the past year. This has involved radio and television spots, posters, brochures, and a Web site (www.MaineHealthyBeaches.org), all of which have been effective tools in spreading the message of best practices at the beach and notifying the public of advisories and closures. In just two months this summer, there were 10,790 hits on the Web site. HCB volunteers have also completed four sanitary surveys and conducted intensive stream and other site sampling to identify and remediate pollution sources in Lincolnville, Mt. Desert, South Portland, and Kennebunkport.

Recreational Island Monitoring and Intertidal Zone Monitoring projects launched

Between the public islands on the Maine Island Trail and the numerous islands managed by land trusts, private entities, and state and federal agencies, there are well over 100 islands on the Maine coast that are open to various levels of recreational use. Given the importance of the tourism industry to Maine's coastal economy, it has become all the more important to develop management strategies that protect recreation destinations while preserving island ecosystems and ensuring public access. In 2004, Marine Extension Associate Natalie Springuel agreed to lead the effort to develop a Recreational Island Monitoring Program. This past summer, the Island Monitoring Task Force successfully completed its first field season, which tested monitoring methods, established baseline information, and recruited volunteers.

MET member Tracy Hart serves as coordinator of the intertidal component of the Recreational Island Monitoring Program, which aims to develop indicators and methods for assessing the potential impacts of activities concentrated in the intertidal zone, which traditionally have not been assessed. This pilot project is intended to be the first of several intertidal monitoring programs that the Marine Extension Team plans to initiate.

In future years, the Recreational Island Monitoring Project will be expanded to include additional islands, a more comprehensive volunteer program, and outreach efforts. The project will result in data and a toolbox of methodologies that can be used by managers of public and private islands throughout the Maine coast.



Salt marsh monitoring manual published

A new manual, *A Volunteer's Handbook for Monitoring Maine Salt Marshes*, is now available to support monitoring efforts in the state. Based on a similar manual focusing on New Hampshire salt marshes, the handbook was developed by Maine Sea Grant and salt marsh ecologists and is the first of its kind in Maine. The document provides an overview of the ecology, conservation, and threats to Maine salt marshes, and details the field methods and techniques needed by volunteers to successfully monitor their local salt marshes. In a pilot project initiated in July 2004, volunteers used the manual to monitor two marshes in southern Maine and one salt marsh in downeast Maine.

Volunteers help keep clam flats open and reduce public health risks

Volunteers in the Clean Water/Partners in Monitoring Program study the health of coastal waters by monitoring for dissolved oxygen, temperature, pH, salinity, and fecal coliform bacteria. Eighty trained volunteers are providing a statewide First-Alert System to the Department of Marine Resources for the protection of public health, meeting the local, state agency, and scientific data needs for real-time and baseline information. As a result of successful monitoring efforts in Maine, thousands of acres of clam flats have been reopened over the past decade.

COASTAL COMMUNITIES

Maine's coastal communities are facing significant pressures as market forces shift population and economic activity. Traditional working waterfronts and access to the shore have been displaced by commercial and residential development. Community development approaches involving local residents in addressing desirable and undesirable change can be successful, and economic strategies exist that can prevent the "hollowing out" of coastal communities. In partnership with other state, regional, and local entities, Marine Extension Team members work with coastal communities on issues of land use planning; sustainable development; shore access; nature-based tourism; use conflicts; economic development; and habitat assessment, preservation, and restoration.

Addressing conflicts between new residents and traditional coastal industries

With rising property values, many communities are transforming from traditional marine resource economies to those driven more by real estate markets and tourism. In 2004, Sherman Hoyt represented Maine Sea Grant on the Working Waterfront Coalition, a group of fishing industry associations, marine agencies, and municipalities that is finding ways to preserve what remains of the working waterfront. In related activities, a brochure (*Moosabec: The Downeast Fishing Community of Beals and Jonesport*) was developed with the Washington County Council of Governments and the communities of Jonesport and Beals to define for newcomers "what it means to live in a waterfront community." Another publication (*Public Shoreline Access in Maine*), created in cooperation with the University of Maine Marine Law Institute, discusses the public trust doctrine as it relates to the "fishing, fowling, and navigation" law, as well as access to the beach and to the intertidal zone. This publication updates and expands a similar publication from the early 1990s, and will educate the public, landowners, and industry about laws and current trends that may affect access to the shore.

Marine area characterization working group develops recommendations

Over the last year, MET member Tracy Hart and Jennifer Atkinson of the Quebec-Labrador Foundation have been co-coordinators of the Marine Characterization Working Group. This working group, comprised of scientists, state agency personnel, and nonprofit organization staff, has developed recommendations for conducting marine inventories in Maine. These recommendations are forming the framework for a citizen's guide to marine characterizations. The guide is now being compiled and, when published, will help Maine residents in collecting existing information and new data on the ecological, physical, historical, and socioeconomic attributes of their local coastal areas.

Publication educates residents on Maine's unique salt marsh ecosystems

Sea Grant published and distributed *Maine's Salt Marshes: Their Functions, Values and Restoration*, which is now used by several communities in southern and eastern Maine where major salt marsh restoration efforts are under way. The publication has been credited with helping to

educate the citizens of Addison and Columbia, where voters approved the West Branch Pleasant River restoration initiative at their annual town meetings. This booklet is part of a two-piece set that has been produced in cooperation with University of Maine Cooperative Extension, Wells National Estuarine Research Reserve, Maine Coastal Program, NOAA, and the Pleasant River Wildlife Foundation.

Maine's Salt Marshes:
Their Functions, Values, and
Restoration *has a wealth of
information about these unique
ecosystems.*



Marine Extension Team member serves as regional contact for nonpoint pollution education program

Sarah Gladu is the regional contact for Project NEMO (Nonpoint Education for Municipal Officials), an educational program for local decision makers that addresses the relationship between land use and natural resource protection. It focuses on water resources, land use planning, nonpoint source pollution, and stormwater runoff. Maine NEMO also encourages and establishes collaborative relationships among regional and state agencies, as well as land management-related organizations. Sarah's work targets coastal municipalities, who face unique issues and concerns.

Radar reflectors may improve recreational boater safety

With the assistance of the U.S. Coast Guard, MET member Natalie Springuel coordinated field trials to test the effectiveness of kayak radar reflectors in July 2004. Five kayakers ran a course with a dozen different reflectors from multiple manufacturers as Coast Guard vessels picked up the radar signals, which varied in strength. The next steps will include outreach to the Coast Guard Auxiliary and Maine Marine Patrol to repeat trials on vessels with different kinds of radar. In addition, the research group is in the process of designing reflectors for sea kayaks that may be more efficient than traditional models.

Residents work together to define Mount Desert Island's preferred future

Mount Desert Island is home to nearly a quarter of Hancock County's citizens, comprising four towns and the bulk of land administered by Acadia National Park. A solid year-round economy based on science and technology, boat building, fishing, health care, government services, and construction is bolstered by seasonal tourism but faces pressures stemming from development.

Since the fall of 2001, nonprofit organizations and citizen volunteers have worked together to define a "preferred future" for Mount Desert Island. Working with MET member Ron Beard, a steering committee has organized community conferences, described present conditions, framed key issues, laid out alternative solutions and, with the assistance of the University of Maine Department

The MET is working with the U. S. Coast Guard to determine if radar reflectors make kayakers more visible to larger vessels.



of Resource Economics and Policy, surveyed year-round and seasonal residents about policy options to address the issues.

In June 2004, the group published a 16-page supplement to the Bar Harbor Times and Mount Desert Islander newspapers (combined circulation 10,000) to summarize the survey results and progress in the community development process known as Mount Desert Island Tomorrow.

Working Waterfront forum takes to the road

In December 2003, the MET partnered with Gulf of Maine Foundation, Maine Coastal Program and Island Institute to present "Working Waterfront Access 2003," a daylong forum to share information and experience across industries and communities about the future of Maine's working waterfront. The forum highlighted the value of Maine's diverse waterfront, and identified challenges and solutions for water-dependent communities and businesses. The forum was attended by over 90 people and received very positive evaluations. In response to participant feedback to "take the show on the road," Natalie Springuel and Chris Bartlett of the Marine Extension Team have since partnered with University of Maine at Machias to begin planning a waterfront access forum in the Downeast region, which will be modeled after the successful 2003 event.

FISHERIES

Maine's commercial and recreational fisheries are important economic and social components of coastal communities, providing upwards of 26,000 jobs and well over \$800 million in landings and other revenue. Current and future issues in the fisheries industry include access, management, impacts of resource exploitation, and the status of the stocks themselves. Failure to address such issues effectively will lead to profound changes along the entire coast, from job loss to irrevocable real estate conversion and damage to natural resources. Marine Extension staff members promote new fisheries research techniques and management strategies, and help develop effective fishing gear that minimizes impacts on the marine environment and endangered species. They also promote the involvement of industry in data collection and encourage research partnerships between scientists and harvesters.

Lobster zone council process continues to improve

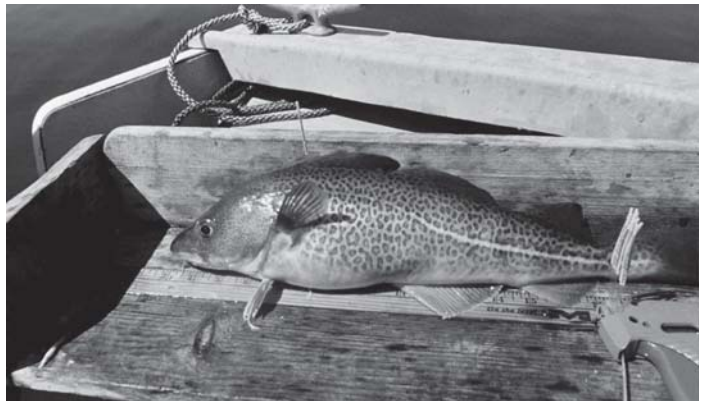
Marine extension staff is partnering with the Maine Department of Marine Resources to improve the function of the Lobster Zone Process. A collaborative process of managing the Maine lobster resource will promote a sustainable lobster fishery and may be integrated with other management strategies practiced throughout the Gulf of Maine. Marine Extension Team staff and University of Maine researchers are assisting the Lobster Zone Process to use the best information available for decision making by combining traditional science with participatory science, biased sampling data (sea sampling), and fishermen's observations.

Fisheries education workshops offered in New England

The decline of many commercial fisheries in New England has led to drastic actions to reverse over-fishing and improve fisheries management. Regulatory actions and economic consolidation have reduced the fishing capacity of many coastal communities traditionally dependent on commercial fishing. Also, marine resource management in the Gulf of Maine has become increasingly complex over the past decade. To inform the fishing industry and coastal communities about some of these issues, MET members offered a Fisheries Education Workshop Series on bycatch reduction in the groundfish industry, the use of marine protected areas as a fisheries management tool, and rights-based fisheries management. These three workshops were part of a northeast regional Sea Grant Fisheries Extension Enhancement project, involving the Connecticut, New Hampshire, and Maine Sea Grant programs and coordinated by Rhode Island Sea Grant. MET member Sherman Hoyt coordinated the three workshops held in Maine.

Fish tagging project identifies migration patterns of Atlantic cod

How Atlantic cod move in Gulf of Maine waters is still a mystery. The Northeast Regional Cod Tagging program aims to tag over 100,000 Atlantic cod within two years, using a standardized tagging technique, throughout the Gulf of Maine and neighboring waters in Canada and southern New England. Chris Bartlett is coordinating the Maine-based effort, and in 2003, project partners completed 19 trips, tagging and releasing 505 cod in the nearshore waters of Passamaquoddy Bay. During 2004, 67 cod have been tagged and released to date. Tag returns are used to monitor and identify the migration patterns of Atlantic cod throughout the study region, and they provide valuable growth information. The cod tagging project is an example of a collaborative research initiative in which commercial fishermen work closely with scientists.



MET staff work with scientists and fishermen to monitor the migration patterns of Atlantic cod.

Marine Extension collaborates with harvesters to reduce impacts of fishing gear

The Marine Extension team is working with harvesters to develop gear that decreases the catch of undersized fish and untargeted species, reduces impacts on the seafloor, and meets other fisheries management needs. Extension Associate Dana Morse is working with Boothbay Harbor fishermen to reduce bycatch and improve energy efficiency and mesh size enforceability in trawl nets. The size, shape, and materials used in mesh netting of trawls influences the species and sizes of fish that come up in the net. Traditionally, twine is knotted, which decreases the space available for fish to escape from the net, and more energy is required to tow it than knotless netting.

This study will help to evaluate escapement by undersized fish, and any energy savings that might occur by using the newer mesh. Initial field trials suggest that the knotless twine remains more fully open during trawling, and escapees may suffer less scale loss and other damage during the escape process.



from the state and federal shrimp scientists estimating the shrimp population.

In April 2004, MET staff conducted three daylong workshops in partnership with the Atlantic States Marine Fisheries Commission. Sixty fishermen, scientists, and shrimp managers from the three states participated. The workshops produced recommendations for major improvements in the stock assessment process; encouraged more active collaboration between the fishing industry, shrimp scientists, and managers; and promoted using some new management tools for the New England shrimp fishery.

The MET works with Boothbay Harbor fishermen to design gear that will reduce bycatch.

Northern shrimp fishery management workshops promote collaboration

The northern shrimp fishery is a winter inshore trawl and trap fishery that has provided important supplementary income to hundreds of fishermen in Maine, New Hampshire, and Massachusetts since the late 1930s. Shrimp management is the shared responsibility of marine resource agencies from Maine, New Hampshire, and Massachusetts working within the Atlantic States Marine Fisheries Commission. Fishermen have been increasingly frustrated by their lack of input into the shrimp management process and by the difficulty of getting credible stock assessments

Sea Grant receives funding for marine protected areas outreach and education

In June 2004, the Maine Sea Grant Program was awarded National Sea Grant funding to initiate education and outreach on the use of marine protected areas as a tool for fisheries and other marine resource management. This work, building on two successful sessions conducted at the Maine Fishermen's Forum in 2003 and 2004, encourages dialogue and develops opportunities for stakeholders to provide input into local, state, and federal marine protected area issues.

AQUACULTURE

The marine aquaculture industry is important to the coastal economy of Maine, yet public opposition to all marine aquaculture and to specific locations of new farms is increasing. Salmon farm employment and annual production have decreased sharply as the industry has struggled to overcome conflicts with wild salmon restoration efforts, disease, low market prices, and conflicts over new farm sites. Maine's shellfish growers continue to experiment with new farm sites and benefit from a strong market demand for their product. Substantial federal and state research and development investment in aquaculture technology offers hope for the future of the industry in Maine. The Marine Extension Team is uniquely positioned among Maine's agencies and institutions as a neutral source of unbiased information about aquaculture.

Innovations in aquaculture technology help resolve community conflicts

When a fisherman in eastern Maine originally applied for his shellfish lease to grow mussels and scallops, there was strong opposition to the plan because the proposed site was in the middle of a popular and well-used regatta route. As the opposing parties talked about the problem, the topic of a submerged raft arose, and it was an acceptable solution to all. With the technology being new and untested, scale modeling of the proposed system was chosen as a first step. With funding obtained by Extension Associate Dana Morse, tests of a submersible raft were conducted at the University of Maine in conjunction with the Conservation Law Foundation. The collaboration between industry, scientists, and area residents is continuing, as funding for a half-scale field trial is being sought, and supported, by all parties.

Oyster gardens in bloom along the Maine coast

Oyster gardening uses the process of growing oysters to educate participants in topics like estuarine ecology, shellfish biology, aquaculture regulation, and public health. Students receive classroom instruction on the basics of oyster culture, and are assisted in securing the appropriate permits and licenses from the Maine Department of Marine Resources. Early 2004 saw the formation of two groups with both individual and community licenses: the Midcoast Oyster Gardeners, with 18 students in the Damariscotta and Sheepscot Rivers and Muscongus Bay; and the Downeast Oyster Gardens, with six participants in Blue Hill, Taunton Bay, and Stonington. In addition to understanding shellfish aquaculture, students become aware of other marine issues and their personal stewardship ethic is strengthened.

The 12th Annual New England Farmed Fish Health Management Workshop addresses key issues in salmon aquaculture

Nearly 130 salmon industry personnel, scientists, fish health specialists, and agency representatives participated in the 2004 workshop, which was held on April 1 in Eastport, Maine. Speakers traveled from Scotland, Canada, and the United States to present information on topics including monitoring phytoplankton blooms in Cobscook Bay, food safety related to salmon consumption, and the control of Infectious Salmon Anemia. Participating veterinarians received continuing education credit.



EDUCATION (K-12)

Although Maine Sea Grant currently does not have an education coordinator on staff, members of the Marine Extension Team (MET) conduct many formal and informal educational programs and have valuable connections with teachers and students throughout the state. Extension associates are asked to conduct teacher training workshops, assist with lessons, provide field experiences, and participate in curriculum development.

Following are a few highlights of the past year.

The Silver Wake picks up momentum

With a \$102,000 grant from the U.S. Environmental Protection Agency awarded in 2003, University of Maine Cooperative Extension/ Sea Grant and School of Marine Sciences teamed up to develop an environmental education program for middle and high school teachers and students, called *The Silver Wake*. Using marine phytoplankton as a theme, the program engages students in examining and protecting their local environment and demonstrates how local, hands-on science can help meet school reform standards, such as *Maine's Learning Results*.

Now in its second year, *The Silver Wake* has trained 10 middle school teachers and four phytoplankton monitoring volunteers, developed curriculum, and provided assistance on phytoplankton and microscopy activities in participating classrooms. The second workshop of the program, held at the University of Maine in November 2003, featured satellite imagery, data interpretation, and the Gulf of Maine Ocean Observing System. The third workshop was held at the Darling Marine Center in Walpole, Maine, in April 2004 and focused on zooplankton studies, field trips, and curriculum development. In the past year, participating teachers have incorporated more science and technology into their classroom teaching, using microscopes provided by *Silver Wake*, and created computer-based assignments. Coordinators of *Silver Wake* compiled a comprehensive *Silver Wake Resource Notebook* and presented several educational programs, including "The World Through a Drop of Water," to over 300 middle school students.

Silver Wake has a Web site (www.ume.maine.edu/ssteward/silverwake.htm) where classroom activities and resources will be available.

Cobscook Bay drift study goes high tech

Cobscook Bay's dramatic tidal range and strong currents have caused difficulties in predicting the impacts of events, such as oil spills or diseases that plague Maine's salmon farms. MET member Chris Bartlett has been working with the Cobscook Bay Resource Center and high school students in Lubec and Eastport since 1999 to monitor these tidal circulation patterns with drifters. Part of the program has been designed to involve students in collecting meaningful scientific data about the



The Silver Wake uses phytoplankton as a theme for educating and engaging middle school students and teachers.

waters surrounding their communities. In 2004, eight trials have been run so far, and each has demonstrated the complexity and dynamic nature of the Cobscook Bay ecosystem.

Up until recently, PVC drifters were used to track the bay's currents. Beginning in mid-June this year, researchers have deployed Convertible Accurate Surface Tracker (CAST) drifters that contain GPS units. Data from the drifters is exported from ArcView into a format for distribution to researchers at the University of Maine and the Canadian Department of Fisheries and Oceans, and maps for each trial are produced. Researchers plan to develop a detailed analysis to accompany the maps for public presentations.

MERITS provides opportunities for high schools

The Maine Research Internship for Students and Teachers (MERITS) program is a summer program that provides research opportunities for high school students and teachers in the areas of science and technology. Opportunities for teachers and students to engage in hands-on marine research are scarce within Maine. By partnering with MERITS, Sea Grant supports collaboration between the Maine research and pre-college educational communities and encourages students to pursue careers in marine sciences or related technical fields.

Watershed curriculum is pilot tested

After three years in the development stage, *Coastal Connections: Field, Lab and Classroom Experiences Focusing on Coastal Watershed Study in Maine* was released for pilot testing in January 2004. Seven teachers in the southern Maine towns of Kittery, Wells, and Scarborough will test the curriculum unit for a year, during which time they will evaluate the effectiveness of the lessons and provide written assessments that will be used to revise the lessons before the final release of the document statewide.

MET staff worked with a Kittery Middle School teacher to develop the curriculum unit. It was designed to meet the need for a unit aligned with the Maine State Learning Results on the theme of watersheds. The goal of the curriculum unit is to provide students with research skills and field experiences that increase their awareness of human links to their local watershed, while achieving the goals of the state learning standards. Gunter has used the central lessons of the unit in his classroom for years, and these were adapted to meet the needs of teachers in coastal watersheds throughout the state.

High school students are working with MET staff and the Cobscook Bay Resource Center to monitor tidal circulation patterns.



**Maine Sea Grant and University of Maine Cooperative Extension – Marine Extension Team (MET)
Highlighted Projects – 2002-2004**

Chris Bartlett

Washington County Community College, Eastport

Downeast Efforts in the Northeast Regional Cod Tagging Program

2004 Annual New England Farmed Fish Health Management Workshop

Nutrient Study of Cobscook Bay

Salmon Hatchery Effluent Management Utilizing Integrated Polyculture Technologies

Salmon Marking Logistics Working Group

Survey of Atlantic Halibut in Groundfish Closed Areas in the Eastern Gulf of Maine

Sarah Gladu

Knox-Lincoln Cooperative Extension Office, Waldoboro

Maine Phytoplankton Monitoring Program Volunteer Training

Clean Water/Partners In Monitoring

Maine Shore Stewards Advisory Board and Communications Resources

Maine Phytoplankton Monitoring Program

Maine Nonpoint Education for Municipal Officials (NEMO) Program

Medomak Watershed Pollution Assessment

Healthy Coastal Beaches

Tracy Hart

Coastal Studies Center, Orr's Island

Needs and Issues in the Taunton Bay Region: A Survey of Residents from Franklin, Hancock, and Sullivan, Maine

Developing a Citizens' Guide to Characterizing Discrete Marine Areas in Maine

Enhancing the Involvement of Fishermen and Other Stakeholders in Marine Protected Area Activity Within Maine State Waters and the Gulf of Maine

Where Land Meets the Sea: Developing Volunteer Intertidal Monitoring in the State of Maine

Sherm Hoyt

Knox-Lincoln Cooperative Extension Office, Waldoboro

Building Science into the Maine Lobster Zone Process

Tracking and Evaluation of a Community-based Fisheries Management Test Site: The Georges River Clam Management Program

Development and Use of Stock Enhancement Techniques and Technology Transfer Outreach Materials for Maine's Sea Urchin Fishery

Groundfish Industry Scoping Meetings - Amendment 13 and the Future of the Maine Groundfish Fleet

Fisheries Education Workshops

Maine Sea Grant and University of Maine Cooperative Extension – Marine Extension Team (MET)
 Highlighted Projects – 2002-2004

Dana Morse

Darling Marine Center, Walpole

- Developing and Testing Novel Methodology for Land- and Nearshore-based Aquaculture of the Green Sea Urchin
- Northeast Aquaculture Conference and Expo 2004
- Field Trials of 4" Rings in the Inshore Scallop Fishery of the Gulf of Maine
- Selective Gear Research and Development to Reduce Bycatch: Investigating the Use of Square Mesh Side Panels and Increased Taper in a Groundfish Trawl
- Scallop Stock Enhancement
- Oyster Gardens

Natalie Springuel

College of the Atlantic, Bar Harbor

- Waterfront Access
- Gulf of Maine Expedition Institute
- Safety Study of Radar Reflectors on Sea Kayaks
- Sea Kayak Safety and Stewardship Brochure
- Recreational Island Monitoring Survey
- Sustainable Tourism

Esperanza Stancioff

Knox-Lincoln Cooperative Extension Office, Waldoboro

- Healthy Coastal Beaches Study Elements
- Healthy Coastal Beaches Online Database
- Healthy Coastal Beaches Marketing Campaign
- The Silver Wake Program

Kristen Whiting-Grant

Wells National Estuarine Research Reserve, Wells

- Beach Profiling Monitoring Program
- Microbial Source Tracking in Two Southern Maine Watersheds
- Salt Marsh Restoration Publications
- Our Future By Design

Ron Beard

Hancock County Cooperative Extension Office, Ellsworth

- Cranberry Isles Mainland Access Facilitation
- Marine Protected Areas Workshop Facilitation
- Mount Desert Island Tomorrow

COMMUNICATIONS

Many communications activities during the last year have supported the work of the Marine Extension Team (MET), a collaboration of Maine Sea Grant and University of Maine Cooperative Extension. Communications staff worked closely with the 10 marine extension staff members to deliver technical information in many different written formats. This included developing fact sheets, project reports, and guides; contributing to local and national publications; and writing and distributing press releases, brochures, and other informational materials.

One of the challenges for communications is tracking and evaluating publications and media coverage. This past year, we developed a database to track publication requests and distribution, as well as media placement, and are working with the MET to ensure that publications are evaluated effectively.

Following are a few highlights of the recent past.

College Designation Support Materials

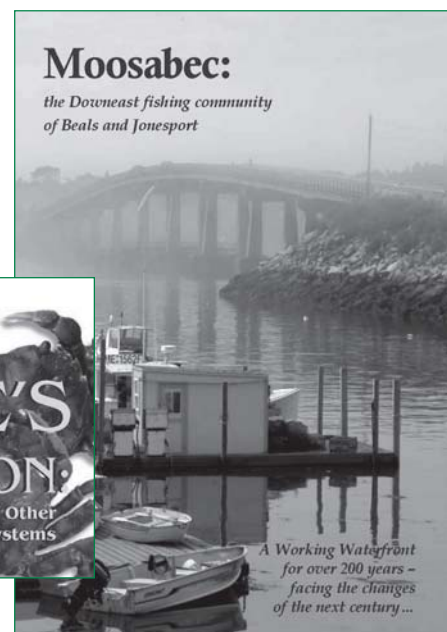
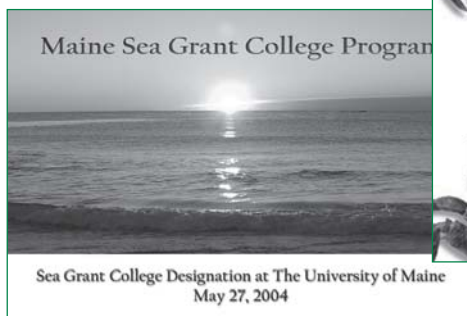
Working with the University of Maine Marketing and Public Affairs Department, communications produced several collateral materials to support the Maine Sea Grant College Designation ceremony, which was held on May 27. These included the program, banners to hang in the ceremony hall and lobby, magnets and Sea Grant logo-imprinted chocolates for attendees, and jackets as gifts of appreciation for speakers. Communications also produced the 55-page briefing book for the College Designation Site Review Team.

Marine Invasive Species Materials

Working with members of the MET, Communications staff produced the promotional brochure for *Maine's Marine Invasion: A Forum on the Impact of Non-native and Other Invasive Species on Maine's Coastal Ecosystems*, which was held on May 5, 2004, at the University of Southern Maine. Communications staff also produced the first in a series of fact sheets, *Marine Invasive Species in Maine*, for local officials, marine managers, and the general public. The fact sheet is a direct result of the forum and will help to inform future research and policy decisions.

Moosabec: The Downeast Fishing Community of Beals and Jonesport Brochure

Working with Washington County Council of Governments and several MET staff members, communications produced an educational brochure about what it is like to live in the commercial fishing communities of Jonesport and Beals in downeast Maine. The document is intended to promote understanding among newcomers and existing residents over traditional uses of land and water. This template will be used for other coastal communities that have expressed interest in developing similar educational materials. Communities now have a tool to inform the public and give the same information to those engaged in the process of identifying and resolving coastal access issues.



Maine's Salt Marshes: Their Functions, Values, and Restoration Booklet

This four-color, 16-page resource guide is part of a two-piece set produced in cooperation with the Wells National Estuarine Research Reserve, Maine Coastal Program, NOAA, and the Pleasant River Wildlife Foundation. It discusses, in layperson's language, the value of salt marshes and raises awareness of the need for their preservation and restoration. Distribution of the booklet has initially focused on community members in Wells (in southern Maine) and Addison and Columbia (Downeast) where major restoration efforts are currently under way. The publication has been credited with helping to educate the citizens of Addison and Columbia where voters approved the West Branch/Pleasant River restoration initiative at each of their annual town meetings. This popular guide is currently being reprinted.

Public Shoreline Access in Maine: A Citizen's Guide to Ocean and Coastal Law

Communications and MET staff collaborated with the Marine Law Institute of the University of Maine Law School to create an eight-page informational booklet entitled *Public Shoreline Access in Maine*. This publication updates the popular citizen's guide on *Public Shoreline Access and the Moody Beach Case*, which the Marine Law Institute and Maine/

New Hampshire Sea Grant produced in 1990. This booklet is a critical missing link in educating communities about the law and options for maintaining public access.

Research in Focus Fact Sheet

This is the first in a series of fact sheets highlighting marine science research at the University of Maine's School of Marine Sciences. The topic of the fact sheet, *Effects of Shrimp Trawling on Mud Bottom Habitats and Animal Communities of Fishing Grounds in the Gulf of Maine*, has been of great interest to fishermen and environmentalists alike.

Volunteer Monitoring Along Maine's Coast: Citizen Stewards Caring for the Environment Booklet

This 12-page booklet describes the 10 volunteer monitoring programs of the Maine Shore Stewards, a collaboration of The University of Maine Cooperative Extension, Maine Sea Grant, the Maine Coastal Program of the State Planning Office, and the Maine departments of Marine Resources and Environmental Protection.

New Program Brochure

To inform the public of Maine Sea Grant's services, communications produced an expanded program brochure, which will be distributed at conferences and workshops in the coming year.



The 12th Annual New England Farmed Fish Health Management Workshop Materials

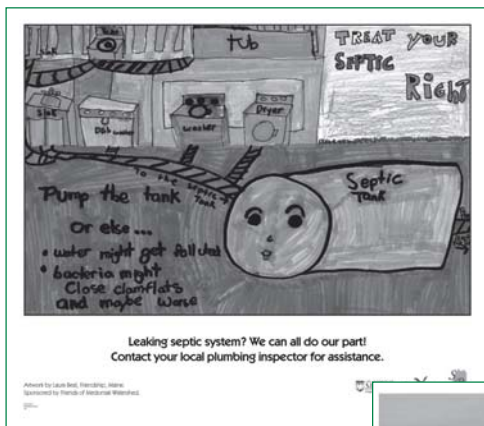
Communications produced the promotional brochure, program with abstracts, and Web page for this event, which is held annually in downeast Maine to address some of the key issues involved in salmon farming. Over 120 industry representatives and scientists from Canada, Norway, Scotland and the U.S. attended the workshop.

Treat Your Septic Right Poster

Communications published this colorful and fanciful poster, which was designed by a fourth-grade student at Friendship Village School, in Friendship, Maine, and sponsored by the Friends of Medomak Watershed (FOMW). It will be distributed by FOMW to respective grocery stores, town offices, and seafood distributors in midcoast Maine.

Sea Grant Display/ Postcards

To increase Maine Sea Grant's visibility at the University of Maine, communications produced a display that was installed for two weeks in the Memorial Union, one of the most heavily used buildings on campus. In addition, communications staff produced a series of four full-color postcards of fishing boats and harbors that were distributed at the 2004 Maine Fishermen's Forum, which draws nearly 10,000 attendees every year.



Media Workshop at the 2004 Maine Fishermen's Forum

Working with the University of Maine's Public Affairs Department, communications staff coordinated a facilitated workshop called *Breaking Down the Barriers: Fishermen, Scientists, and the Media*. Over 80 participants attended the session, which provided valuable tips on how the fishing industry and scientific community can communicate more effectively with the news media.

Feature Article

Catherine Schmitt, science writer, wrote an article profiling Sheril Kirshenbaum, a graduate student in the School of Marine Sciences at the University of Maine. Kirshenbaum is working on a Sea Grant-funded project researching sea cucumber biology and population dynamics. The story will be published in *Natural New England* magazine.

Web Site Redesign

Communications worked closely with Maine Sea Grant's information technology coordinator to revamp the program's Web site, following University and National Sea Grant guidelines, as well as ADA-compliance regulations.

Press Releases

Communications produced the following press releases:

Seabed Drifters Released Soon in Saco Bay - June 25, 2004

Bacterial Contamination in Little River Watershed Traced to Pets, Wildlife, and Livestock - June 9, 2004

The University of Maine Joins Sea Grant College Program - May 19, 2004

Scientists and Professionals Tackle Marine Bio-Invasers in Maine Waters - April 16, 2004

New Science Writer Joins Maine Sea Grant - April 9, 2004

Farmed Fish Health Workshop Draws International Speakers - March 3, 2004

Maine Sea Grant Staff — Board/ Committee Participation 2004

Aquaculture Education and Research Center, Board of Directors - Dana Morse
Bay Management Working Group- Paul Anderson
Maine's Healthy Coastal Beaches Program, Advisory Board- Esperanza Stancioff (chair), Keri Lindberg, Sarah Gladu
Caribou Bog - Penjajawoc Corridor Project, Advisory Board- Cheryl Daigle
Clean Boatyards and Marinas- Natalie Springuel
Cobscook Bay Fishermen's Association- Chris Bartlett
Cobscook Bay Resource Center Board (chair)/ Executive Committee- Chris Bartlett
Community Wellness Coalition, Steering Committee and Executive Committee-Kristen Whiting-Grant
Cove Brook Watershed Council (vice president)- Susan White
Data Assessment Team- Esperanza Stancioff
Downeast Institute for Applied Marine Sciences and Education, Board/Executive Committee- Chris Bartlett
Downeast Resource Conservation and Development, Vacationland Resource Committee- Natalie Springuel
Friends of Medomak Watershed- Sarah Gladu
Georges River Shellfish Management Committee- Sherman Hoyt
Governor's Task Force on Aquaculture (chair)- Paul Anderson
Great Works Watershed Coalition- Sarah Gladu
Gulf of Maine Council on the Marine Environment, Habitat Monitoring Subcommittee- Tracy Hart
Gulf of Maine Council on the Marine Environment, Habitat Restoration Subcommittee-Kristen Whiting-Grant
Gulf of Maine Council on the Marine Environment and EPA, Indicators Workshop Steering and Planning Committee-Tracy Hart
Gulf of Maine Council on the Marine Environment, Sustainable Tourism Task Force- Natalie Springuel
Healthy Acadia, Advisory Committee- Natalie Springuel
Herring Gut learning Center, Advisory Committee- Paul Anderson, Dana Morse
Island Monitoring Task Force (chair)- Natalie Springuel
Maine Aquaculture Innovation Center Board- Paul Anderson
Maine Association of Sea Kayak Guides and Instructors- Natalie Springuel
Maine Atlantic Salmon Recovery Summit, Steering Committee- Susan White
Maine Beaches Conference, Steering Committee- Kristen Whiting-Grant, Susan White
Maine Fishermen's Forum Board (president)- Paul Anderson
Maine Island Trail Association, Board of Trustees- Natalie Springuel
Maine Marine Area Characterization Working Group- Tracy Hart
Maine NEMO Advisory Board- Sarah Gladu, Esperanza Stancioff
Maine Phytoplankton Monitoring Program, Advisory Board- Sarah Gladu, Esperanza Stancioff
Maine Sea Scallop Advisory Council- Chris Bartlett
Maine Sea Urchin Zone Council and Lobster Zone Council D (advisor)- Sherman Hoyt
Maine Shore Stewards, Advisory Board- Esperanza Stancioff, Sarah Gladu
Maine Soft-shell Clam Advisory Council- Sherman Hoyt
Maine Island Trail Association, Board of Trustees- Natalie Springuel
Marine Invasive Species Working Group and Marine Invasive Species Research & Monitoring Subcommittee- Tracy Hart, Paul Anderson
Merrymeeting Bay Advisory Committee- Esperanza Stancioff
Microbial Source Tracking Project, Advisory Committee- Esperanza Stancioff
Narraguagus Bay Clean Water Coalition-Sarah Gladu
New England Farmed Fish Health Management Workshop, Planning Committee (chair)- Chris Bartlett
New England Regional National Ocean Sciences Bowl, Coordinating Committee- Tracy Hart

Northeast Consortium- Paul Anderson
Northwest Atlantic Marine Alliance, Board of Trustees (chair)- Dana Morse
Professional Employees Advisory Council, Professional Development Committee (chair) - Susan White
Public Islands Management Plan, Advisory Committee- Natalie Springuel
Recreation Island Monitoring Project Steering Committee and Intertidal Monitoring Subcommittee-Tracy Hart,
Natalie Springuel
Sea Grant Association Board (secretary)- Paul Anderson
Sea Grant Law Center Advisory Committee- Paul Anderson
Stellwagen Bank National Marine Sanctuary Outreach & Education Working Group, Sanctuary Management Plan
Review Process- Tracy Hart
University of Maine Aquaculture Research Institute, Planning Committee- Paul Anderson
University of Maine Research Council- Paul Anderson
University of Maine School of Marine Sciences, Policy Advisory Committee- Paul Anderson
USDA Infectious Salmon Anemia Technical Board (chair)- Chris Bartlett
Washington County Community College, Adventure Recreation and Tourism Program Advisory Committee-
Natalie Springuel
Washington County Community College, Waterfront Management Committee- Chris Bartlett
Wells National Estuarine Research Reserve, Education Advisory Committee- Kristen Whiting-Grant
Working Waterfront Coalition- Natalie Springuel, Sherman Hoyt, Chris Bartlett
WNERR Coastal Training Program, Advisory Committee- Kristen Whiting-Grant



SCIENTIFIC PUBLICATIONS

Peer-reviewed Journal Articles/ Books

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Other Publications

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Published abstracts

- Limbeck, S., and P. D. Rawson, 2003, Species-specific variation in thermal tolerance during larval development in blue mussels, *Mytilus* spp., *Journal of Shellfish Research*, 22:340-341.
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- Rawson, P. D., C. Slaughter, and P. Yund, 2002, Asymmetric gametic incompatibility among two species of marine mussel, *American Zoologist*, 41:1564.



GRADUATE STUDENTS

Theses

Susan Limbeck, 2003, *The role of larval thermal tolerance in species distribution of blue mussels within the Gulf of Maine*, M.S. in Marine Biology.

Kevin Scheirer, 2003, *Analysis of the spatial dynamics of the American lobster fishery along the coast of Maine*, M.S. in Marine Policy.

Fellowships

Coastal Management Fellowship Program

Ed Cervone, a master's degree student in Ecology and Environmental Sciences at the University of Maine, just completed his first year of the prestigious two-year Coastal Management Fellowship Program. He has been working with the Delaware Coastal Programs and Delaware Division of Air and Waste Management on a dual-agency project entitled, "Development of a Brownfields Restoration and Re-Use Site Description Compendium for Coastal Communities." So far, he has conducted fieldwork and records research to create an inventory of brownfield properties for the City of Wilmington. The end product will be a paper and digital compendium of properties with an accompanying GIS tool to be used by planners and developers. This will be used to help develop a community plan and promote neighborhood revitalization and economic development in the southern section of the city near the port where a 3-year Special Area Management Plan is being developed. Cervone is also working on a number of coastal projects, including shorebird research, horseshoe crab surveys, and open space restoration. As Cervone says, "This has been a great opportunity and I highly recommend it to others."

Julia Knisel, a postgraduate student in Marine Policy at the University of Maine, completed her two-year Coastal Management Fellowship in March 2004. She worked with the Coastal Hazards Section of the North Carolina Division of Coastal Management (DCM) and the Civil Engineering Department of North Carolina State University (NCSU) to update the State's Inlet Hazard Areas of Environmental Concern (IHAEC). These areas are vulnerable to erosion, flooding, and other adverse effects of sand, wind, and water because of their proximity to dynamic ocean inlets. The last update was conducted in 1981.

Since historical changes in shoreline position can be determined from aerial photography, Knisel much of her time locating, acquiring, and scanning historical aerial photographs of the inlets. She refined a procedure to digitally rectify these photographs to monitor historical shoreline changes, trained students to use the photogrammetric software, and created and managed a database to track the progress of these tasks. Methods to analyze the shorelines were explored and a GIS extension was identified as a valuable tool for this project. At the end of her fellowship, DCM and NCSU had all of the tools needed to complete the IHAEC update.

According to Knisel, "Hurricane Isabel and the destruction of Hatteras Island—which caused a new inlet, erosion, and overwash of dunes—impacted my fellowship the most. I observed various responses to the disaster and worked with DCM staff to reestablish a vegetation line, which is the baseline for DCM's oceanfront development setback. Overall, the NOAA Coastal Management Fellowship enhanced my understanding of state-level coastal management and refined my career goals."



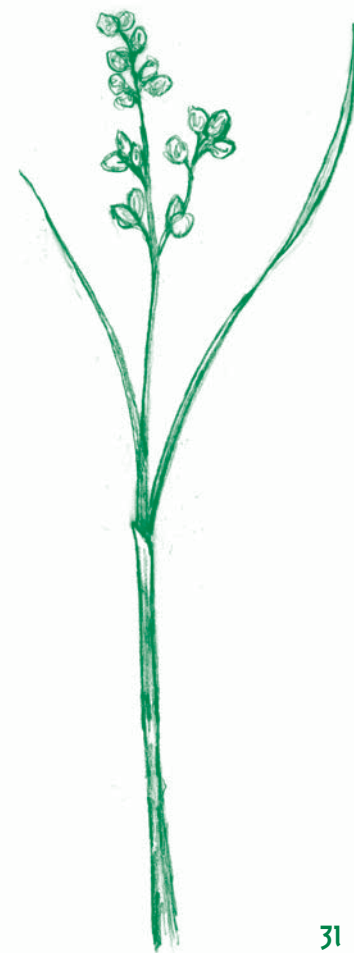
Dean John A. Knauss Marine Policy Fellowship

Amanda Leland was a University of Maine 2003 Knauss Marine Policy Fellow. She conducted her fellowship in the office of Congressman Sam Farr of California, working as a legislative assistant focusing on issues relating to the marine and ocean environment, animal welfare, and science and technology. She helped draft several pieces of legislation, including the Oceans Conservation, Education, and National Strategy for the 21st Century Act, the Clean Cruise Ships Act, and the Southern Sea Otter Recovery and Research Act. In addition, she helped secure appropriations for ocean conservation and science programs in the National Oceanic and Atmospheric Administration. Leland currently works with the Ocean Policy Project in Washington, D.C.

EXTERNAL GRANT AWARDS

Many members of the Maine Sea Grant/ Cooperative Extension Marine Extension Team participate in projects that are funded externally. With funding levels basically flat and an ever-increasing budgetary obligation to staff salaries, it is important that MET members attract extramural funding to help support extension programming. Also, Maine Sea Grant administers grant programs for the Maine Oil Spill Advisory Committee (MOSAC) of the Maine Department of Environmental Protection and the Maine Infrastructure and Technology fund. In the past year, our external grants include:

Building Capacity in the Research Community in Maine for Collaborative Fisheries Research Northeast Consortium	\$40,000
Maine Infrastructure & Technology Fund (administrative fee)	\$24,250
Maine Department of Environmental Protection (MOSAC administrative fee)	\$18,098
New England Farmed Fish Health Management Workshop Agricultural Research Service	\$5,000
<i>From Store to Shore: A Sea Kayaker's Guide to Safety and Stewardship in Maine</i> Brochure	\$2,520
LL Bean (\$300)	
MASKGI (\$500)	
Maine State Kayak Guide Service (\$300)	
Kittery Trading Post (\$300)	
U.S. Coast Guard (\$600)	
Seaspray Kayaking (\$220)	
Cadillac Mountain Sports (\$300)	
<i>Maine's Salt Marshes: Their Functions, Values, and Restoration</i> Booklet	\$2,100
Maine Coastal Program (\$1000)	
Pleasant River Wildlife Federation (\$500)	
Downeast Salmon Federation/Downeast Rivers Land Trust (\$500)	
Otto Green (\$100)	



PROGRAM DEVELOPMENT AWARDS

The Maine Sea Grant Program has a modest pool of funds reserved for program development. Most of these funds are used for small research awards to help scientists prove a concept or collect preliminary data that can then be used to develop full research proposals to Sea Grant or other funding agencies. These funds are also available for conference and travel support, as well as for other types of programming that is consistent with Maine Sea Grant's mission. Although there is no formal request for proposals and these funds are generally available throughout the year, the Maine Sea Grant Program has recently established a protocol that provides more organizational guidance in the use of these limited funds. For example, proposals submitted to the program via the Project Proposal Form (available at www.seagrants.umaine.edu) are received throughout the year, but are evaluated on three scheduled decision points: June 1, October 1, and February 1. This allows the program to ensure that this type of funding is available throughout the year for issues that require an urgent response. The program allocates these funds in a manner similar to the general Sea Grant budget as follows: research – 50%; extension / education – 30%; workshops / conferences – 10%; and other – 10%.

Research Projects

Ambrose, W. *Preliminary Investigation of Sediment Disturbance from Bloodworm Digging*. \$3,000. Supported the collection of preliminary information on the intensity of disturbance to intertidal mudflats from commercial bloodworm harvesting.

Baron-Taltre, B. *The Rise and Fall of the Maine Sea Urchin Industry: A Failure of Institutions and Management?* \$1,000. Provided support for a graduate student to describe and evaluate the institutions and management of the Maine sea urchin industry.

Billings, C. *The Lobster Institute Web Site*. \$2,500. Supported development and redesign of the Lobster Institute's Web site.

Hopkins, W. *A Survey of Waterfront Access Points in Cobscook Bay*. \$5,300. Provided funds for researchers to interview harbormasters, town officials, and resource users to document public and private access points around Cobscook Bay, locate the sites using GPS technology, and build a geographic information system data layer of access points.

Machaiek, K. *Ocean Classroom Foundation Education Under Sail*. \$2,000. Provided tuition assistance to a high school student to attend the Ocean Classroom's semester at-sea education program.

Morse, D. and J. Riley. *Scale Model Testing of a Prototype Submersible Mussel Raft*. \$2,400. Supported research and development of submersible mussel raft technology for aquaculture.

Riley, J., and M. Peterson. *Comparative Study on the Underwater Maneuverability of Gray and Humpback Whales*. \$5,000. Provided support for researchers to deploy electronic tags on gray and humpback whales to collect detailed data on their underwater movements.

Trott, T. *Defining the Maine Piece of the New England Invasive Species Jigsaw Puzzle: Field Site Selection Using Critical Invertebrate Areas as Sampling Locations*. \$4,000. Supported a project, using island and coastline case studies, to document ecological change by assessing community composition and structure following invasive species introductions.

Conference Support

Annis, E. *International Conference and Workshop on Lobster Biology and Management*. \$1,500. Funded travel for student to present research on lobster larval biology.

Atkinson, J. *The Soundings Institute: Advancing the Practice of Community-Based Marine Conservation and Management*. \$2,500. Contributed funds for intensive, four-day workshop retreat for practitioners of community-based marine resource approaches.

Chen, Y. *International Lobster Conference*. \$2,100. Provided travel support for a conference in Australia where Chen presented the results of a Sea Grant-funded project, *Developing Bayesian Assessment Framework for the American Lobster*.

Costa-Pierce, B. *4th Conference on Responsible Fishing*. \$1,000. Supported international conference on responsible, cooperative fishing.

Duff, J. *The Coastal Society 19th Biennial Meeting*. \$1,000. Provided general support for the 2004 meeting of The Coastal Society, designed to bring timely issues of ocean and coastal science and policy to professionals, industry representatives, students, and stakeholders.

Dixon, D., and L. Welles. *Our Ocean's Future: Reforming Governance in the Gulf of Maine*. \$1,000. Sponsored conference on the findings and recommendations of the Pew Oceans Commission and the U.S. Commission on Ocean Policy.

Farrey, P. *U.S./Canada Lobster Summit at Maine Fishermen's Forum*. \$1,500. Supported travel costs for Canadian participants.

Fox, J. *World Aquaculture Society*. \$1,000. Provided travel assistance to annual meeting on marine ornamental aquaculture to explore feasibility of establishing ornamental aquaculture businesses in Maine.

Fuller, B. *Lobstahs! – A Multifaceted Lobstering Exhibit*. \$3,750. Sponsored exhibit at the Penobscot Marine Museum to educate the public about the biology and ecology of the lobster, and related history, economics, arts, crafts, and watercraft.

Garcia, M. *Fourth Annual Maine Coast Natural History Seminar*. \$1,000. Supported annual seminar on Maine's coastal environment, designed for professional guides, educators, and the public.

Morse, D. *Northeast Aquaculture Conference and Exposition*. \$1,000. Sponsored aquaculture industry conference.

Neubert, P. *New England Estuarine Research Society Annual Meeting*. \$300. Supported student travel.

Sage, L. *Northern New England Regional Ocean Sciences Bowl*. \$1,000. Supported national competition for high school students on marine science.

Wahle, R. *International Conference and Workshop on Lobster Biology and Management*. \$3,000. Funded travel to conference for Wahle to present results of Sea Grant-funded research on American lobster population dynamics.

Young, K. *Maine's Marine Invasion: The Impact of Non-Native and Other Invasive Species on Maine's Coastal Ecosystems*. \$2,000. Co-sponsored this one-day forum on marine invasive species, which was a first step toward stimulating interest and commitment to the issue of marine invasives in the state.

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The Maine Sea Grant Policy Advisory Committee (PAC) meets three times per year and provides programmatic advice to the management team and helps develop policy, strategic planning documents, and program evaluation mechanisms. Currently, the PAC includes 22 members, representing research institutions, state agencies, non-governmental organizations, industry groups, and community-based organizations.

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