

Times

Gulf of Maine

Promoting Cooperation to Maintain and Enhance Environmental Quality in the Gulf of

Scientists hit the deck to take stock of Gulf fisheries

By Suzy Fried
Editor

Gulf of Maine — Once you've measured enough silver hake — fish about the size and shape of a stubby cigar — to fill a five-gallon bucket, you're ready to do something else. But scientists collecting the information that will be used to assess the condition of the Gulf of Maine's fisheries know that the more repetitious their work, the better a foundation they are creating for fishery management decisions.

On a recent National Marine Fisheries Service (NMFS) groundfish survey through the Gulf of Maine, scientists based in NMFS' Northeast Fisheries Science Center (NEFSC) in Woods Hole cruised an eight-day loop aboard *Albatross IV*, collecting samples of nearly

three dozen species at about 70 pre-selected stations between Cape Cod, Massachusetts, and Grand Manan Island, New Brunswick.

NEFSC has conducted resource cruises out of Woods Hole since 1885, and standardized bottom-trawl surveys since 1963. On trips along the New England and Mid-Atlantic coast, inshore and offshore, NMFS scientists collect biological information on commercial finfish and shellfish stocks — populations that are associated with particular migration patterns, spawning areas, and fisheries. Oceanographic and meteorological information is also collected on each cruise.

All of this material is entered into one
FISHERY RESEARCH
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Ballast water a vehicle for exotic species invasions

By Suzy Fried
Editor

Gulf of Maine — "Exotic" sounds enticing in a travel brochure or on a dinner menu, but when the word refers to organisms spread from one port to another in a ship's ballast water, it means trouble.

Ballast water pumped onto a ship while it is in port contains marine species native to that area. When the water is later discharged into another port, those organisms can colonize there, affecting the ecosystem.

"Once every hour, about two million gallons [7.6 million liters] of ballast water — which equals two million gallons of plankton from foreign ports — is released in US coastal waters. We refer to this as marine ecological roulette," said James T. Carlton, Director of the Williams College-Mystic Seaport Maritime Studies Program in Mystic, Connecticut. He noted that the National Research Council in 1995 ranked exotic species invasion as

one of five major issues in marine ecosystems management.

Ballast water is a necessary component of shipping. "When cargo is unloaded, the ship floats high like a cork. You put 15 to 35 thousand tons [13 to 32 thousand metric tons] of ballast water into it, depending on the size of the ship, to weight the ship to counteract the buoyancy, which gives the ship better stability and maneuverability," explained Kevin Collard, Director of Operations, Environment and Safety for Marbulk Shipping, an international shipping company based in Salem, Massachusetts.

But in an effort to prevent invasions of coastal ecosystems by non-native species, shippers are being urged to exchange their ballast water in the open ocean, so that the water they discharge into their next port does not contain organisms from their last one.

BALLAST WATER
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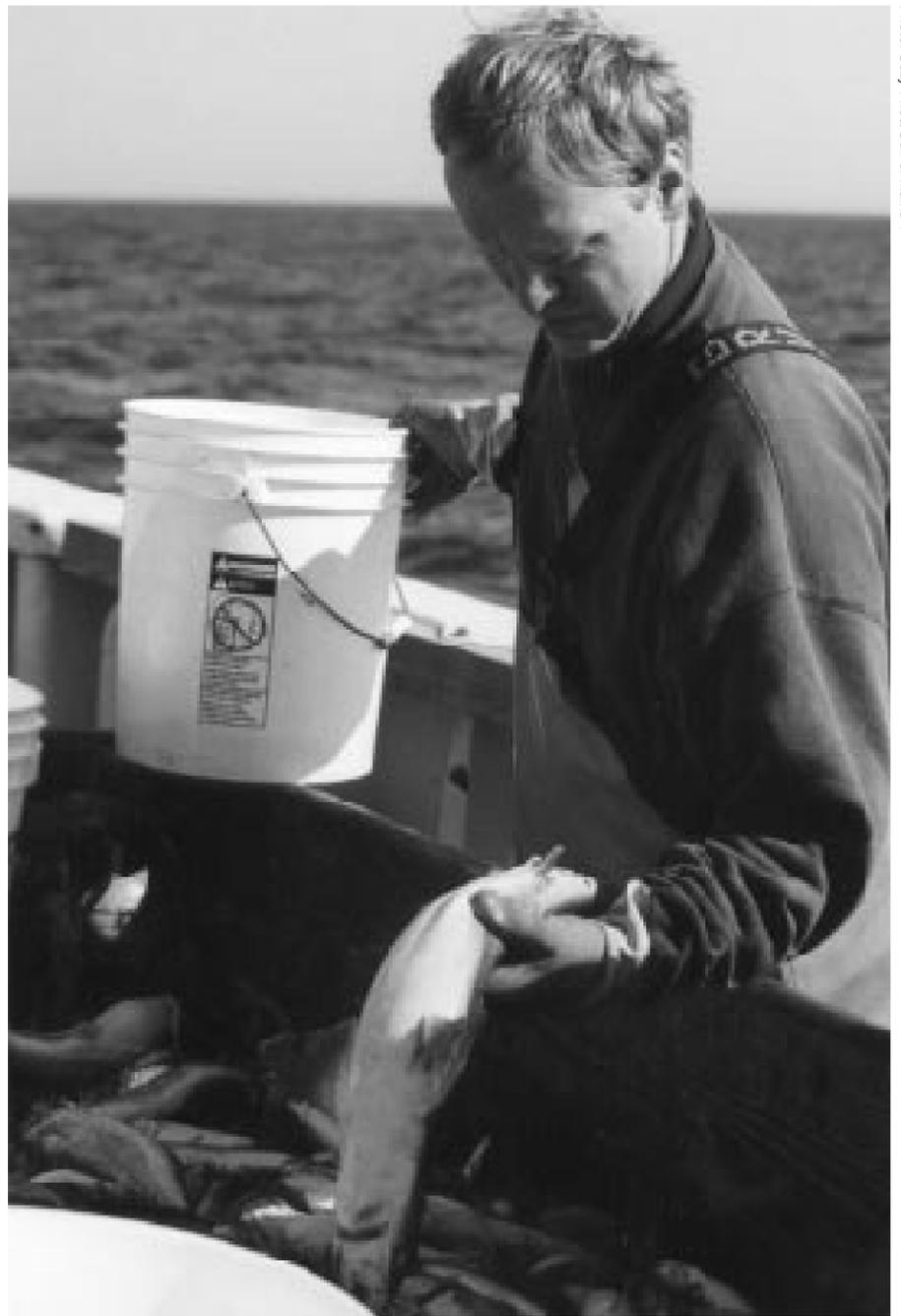


Photo: Suzy Fried/Gulf of Maine T

Oceanographer Glenn Strout sorts the catch during the fourth leg of the Northeast Fisheries Science Center's spring groundfish survey. Scientists will use data gathered on fish species sampled throughout the Gulf of Maine to assess the Gulf's fish stocks.

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The Gulf of Maine Council on the Marine Environment was established in 1989 by the governments of Nova Scotia, New Brunswick, Maine, New Hampshire, and Massachusetts to foster cooperative actions within the Gulf watershed. Its mission is to maintain and enhance environmental quality in the Gulf of Maine to allow for sustainable resource use by existing and future generations.

Visit the Gulf of Maine Council on the Marine Environment's web site at:
<http://gulfofmaine.org>

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Send in your stories

We are always looking for article ideas. Let us know what you are doing to maintain and enhance the marine resources of the Gulf of Maine so that we can help to spread the word.

Also, tell us how the Gulf of Maine is important to you (your business, your community, your family) so that we can report on the issues that matter to you. Send this information to the Editor at the address listed in the masthead above.

An Ecosystem Charter for the Bay of Fundy/Gulf of Maine

Larry Hildebrand
*Head, Coastal Liaison,
Environment Canada*

Do we — the citizens inhabiting the Bay of Fundy/Gulf of Maine ecosystem — have a collective vision for the future of this place we call home? Is there a common set of basic principles by which we live our lives and conduct our activities? Do governments at all levels, businesses, non-government organizations, community groups, Aboriginal people, and interested citizens in both Canada and the US have a shared set of goals and objectives toward which we are striving? Perhaps. But there has been no one place, nor single mechanism through which we can collectively explore and ultimately express a broad, common agenda.

One means of finding and expressing such common values is through the creation of an "Ecosystem Charter." An Ecosystem Charter is a voluntary "good faith" agreement among the broad cross-section of stakeholders in a region that explicitly defines principles, goals, and objectives for an ecosystem approach to management, highlights the actions that are being taken, and provides a vehicle for their expression. To twist an old adage,

it's an opportunity "to put your mouth where your money is."

This is not a new, or untried concept. A very successful Charter exists for another ecosystem shared by the US and Canada, the Great Lakes-St. Lawrence Basin (GLSLB). Launched in 1994, following an extensive period of consultation and cooperative development, this Charter now has over 160 stakeholder endorsements and more are being added every month.

The Charter was developed by deriving the fundamental values and principles inherent in the numerous laws, policies, goals, and objective statements of all governments, non-profit organizations, Aboriginal groups, and community-based organizations in the region. The Charter was then promoted widely and endorsements from stakeholders were secured to comprise a composite view of the basic principles that should guide our relationship with the ecosystem. Visit <http://www.glc.org/projects/ecochart/ecochart.html> to view the GLSLB Charter.

Those endorsing the Charter are expected only to accept its overall intent and to use it as guidance in the development of their work plans and priorities, as

a vehicle to enhance communication and cooperation with others, and as a means for assessing progress toward a shared vision for the basin.

An Ecosystem Charter is a living document that would be revised over time as our understanding of ecosystem management evolves and the views of more and more stakeholders are sought and incorporated. One of the most significant features of an Ecosystem Charter is that is "owned" by all signatories — any school group, church organization, non-profit group, business, agency, or governmental jurisdiction that subscribes to its principles can become a part of this collective vision.

An Ecosystem Charter for the Bay of Fundy/Gulf of Maine would be built on this approach. We are proposing the concept through the *Gulf of Maine Times* to see if there is broad interest in developing such a consensus document. If you think this is something worth pursuing, and/or want to share your thoughts on how we might proceed, please contact: Larry Hildebrand, Environment Canada, 5th Floor, Queen Square, 45 Alderney Drive, Dartmouth, Nova Scotia, B2Y 2N6; E-mail larry.hildebrand@ec.gc.ca or fax (902) 426-4457.

PRIZE DRAWING!

Your response helps the *Gulf of Maine Times*

The *Gulf of Maine Times* is a free newspaper funded through grants and generous contributions from our business partners Gulf-wide. **PLEASE TAKE A MOMENT TO FILL OUT THIS SURVEY** to help us maintain and increase this support. We will draw three responses to win a copy of *Alongshore* by John R. Stilgoe.

1. Do you find the *Gulf of Maine Times* useful?

- Very useful
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 Not useful

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 Not interesting

3. What topics do you want to read more about in the *Gulf of Maine Times*? (Please rank the top 10 in the following list.)

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4. Which sections of the paper do you find the most interesting?(Please rank the following *Gulf of Maine Times* features and explain, if appropriate.)

- In-depth feature articles on major issues _____
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 People profiles _____
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 Available publications, videos, and other materials _____
 Web site lists _____
 News briefs from around the Gulf of Maine _____
 Updates on Gulf of Maine Council activities _____
 Gulf of Maine map _____

5. How do you use the *Gulf of Maine Times*?

(Please check all that apply and rank selections, if appropriate.)

- To increase your general knowledge of the Gulf of Maine
 To contact people for more information
 To learn about initiatives similar to those you are working on
 To get project ideas To help you educate others
 To find out about available resources, such as publications, web sites, and grants
 Other _____

6. What other resources (print, broadcast, web sites, etc.) do you turn to for information about the Gulf of Maine? _____**7. How did you learn about the *Gulf of Maine Times*?** _____**8. Other comments** _____

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Live catch

Gulf of Maine taking a fresh look at the fresh fish market

By Suzy Fried
Editor

Gulf of Maine — For certain restaurants, retailers, and consumers, “fresh” means fish that are swimming in a tank, not lying recently expired on a bed of ice. A growing demand for live catch could provide income supplements, if not alternatives, for Gulf of Maine fishermen, say some in the fishing industry. But opinions differ over how viable the live catch market for North Atlantic species really is.

Nevertheless, government officials and fishing industry representatives are taking a closer look at the live catch market, including Nova Scotia’s Department of Fisheries and Aquaculture, which recently sponsored a three-day workshop on the topic.

Most finfishermen in the Gulf of Maine sell their catch dead, but some North American west coast fisheries have been involved in live catch markets for some time — marketing live finfish to Asian countries and to North American cities with large Asian populations, such as Toronto, Vancouver, Chicago, New York, Boston, Pittsburgh, and Washington, DC.

Who buys the live ones?

Some maintain that it is premature to consider the live catch market more than a niche market in the US and Canada. “I think it has potential, I’m just not convinced that a broad-based interest exists today. Certainly a specialty interest may,” said Roger Berkowitz, President and CEO of Boston-based Legal Seafoods, noting, “If something is served to them with a head on it, mainstream America gets repulsed.” But Berkowitz said the company hasn’t ruled out the live finfish

market, noting, “We may play with it at some point.”

Chris Duffy, a partner in GreatBay Aquafarms, a Portsmouth, New Hampshire company that hatches summer flounder for sale to growout facilities, said he hasn’t seen a big change in the demand for live fish, although he is noticing increasing demand for higher quality and better handled dead fish. Under the current circumstances, he said, “My impression is that it would be something that people would do as complement to business in dead fish.”

But John B. Peters, seafood consultant and owner of Seattle-based Nor’westerly Food Technology Services, believes the live catch market is broadening. “As the world changes so do [people’s] food habits,” he said, asserting that, as consumers become wealthier and more sophisticated, their interest in new kinds of cuisine also grows.

Noting that the same fish now sold as dead catch can’t simply be sold alive as demand for live catch grows, Peters said, “The consumer doesn’t think about having a 20-pound fish — you want a one-pound fish or a half-pound fish. So we’re looking at smaller products that would fit nicely on a dinner plate or a serving plate. That opens up the door on new species of finfish.”

Lobsters, crabs, and other shellfish traditionally sold live in the US and Canada are hardier and easier to transport than live finfish because they don’t need as much room to swim. But Peters said some of the technology developed to improve containment and shipping of live shellfish has led to methods for making containment and transport of live finfish more feasible as well.



Photo: Valentin de Laeys and Hilde Harrison/FV Marico

Fishermen carry live fish ashore in British Columbia. A live catch market is already thriving in Vancouver and other ports, and Gulf of Maine fishing, economic, and government organizations are looking into the viability of marketing live catch in this region.

Research to explore feasibility

The New Hampshire Fishermen’s Cooperative hoped to explore the viability of the live fish market, but has not been able to get research funding, according to cooperative Manager Roger Haymon. Even so, the coop might start experimenting by shipping some live catch to market, he said.

Washington County Technical College plans to work with the Maine/New Hampshire Sea Grant Program and the Maine Gillnetters Association to explore whether bringing in live catch is feasible in a location like mid-coast or Downeast Maine, according to Tom Duym, Division Head of the technical college’s Marine Technology Center.

Most of the research would explore selling live catch to ethnic markets, although Duym said it’s also worth considering selling fish popular in the US — such as flounder, pollack, or cod — in supermarket tanks, much as lobsters are sold now.

Peters said that in his experience with presenting the idea of live catch to the fishing industry, “fishermen’s response has been very strong. This appears to them to be a very good way to preserve their way of business — their way of life.” He also described it as “an ideal means of marketing for aquaculture people.”

Duym, on the other hand, has found fishermen to be interested but cautious. “They want to see something that will work without interrupting the limited amount of days at sea for groundfish they’re doing now.” Harvesting live catch means outfitting boats with aerated containment tanks, and using valuable space for fewer fish. “A fisherman who can bring in 2,000 pounds [907 kilograms] of dead fish may not be able to bring in 2,000 pounds of live fish, due to water weight. Maybe he can bring in 200 pounds [91 kilograms] in addition to his normal catch,” but the market price for the live fish appears to be only about a dollar more per pound of whole dead fish, Duym said.

“If you’re on a one- or two-day trip out of Boston Harbor and can bring in live fish as a bycatch almost and sell them in the greater Boston area, that’s one thing. But you can’t write much of a business plan on live fish only,” given the expense involved, he said.

Some questions remain

Gloucester Fishermen’s Wives President Angela Sanfilippo is skeptical about whether pursuing the live catch market is worth the trouble. “In a tank, the fish is no longer in its natural environment. My common sense and expertise say once they get to these tanks the product will be altered,” and may not be as valuable on the market. Duym agrees that fish can’t be contained indefinitely, as they become subject to stress-related infections.

Peters said the industry is researching techniques for reducing the expense of keeping fish alive. “The major impediment has been weight. With seafood that

means gallons and gallons of water,” making trucking costs expensive, and air shipment outrageous, he said. One idea involves anaesthetizing tuna, slowing their metabolic rates for air shipment, then reviving them at the destination, he said.

There are other complications that come along with the potential benefits of the live catch market. According to Peters, some species harvested for live catch, such as eels, are gathered as juveniles and sent to other places for growout, potentially depleting stocks in their place of origin.

And then there is the animal welfare issue. Some activist groups in the San Francisco area, home to a thriving live catch market, oppose the confinement and sale of live fish for consumption, expressing concern about their containment and the manner in which they’re killed.

Paul Olin, marine advisor with the University of California Cooperative Extension Sea Grant, said local statutes in San Francisco already prohibit cruelty to animals, and he maintains that it is in merchants’ best interest to keep their animals healthy and unstressed, because healthier animals are more valuable. He noted that in the San Francisco live catch market, prices are two to four times greater than those for dead catch. “If we’re going to harvest our natural resources, we should generate as much revenue as we can,” he said.



Photo: Skip Kemp/North Carolina Sea Grant Program

North Carolina fishermen lift live southern flounder from a pound net trap. Bringing in live finfish requires careful handling of the fish as they’re caught and brought to shore, making it a more expensive practice than bringing in a dead catch. But higher market prices may offset that cost.

Wildlife biologist Peter Hicklin

Unearthing evidence that mud matters

Photo: Art Gingert



Peter Hicklin

By Suzy Fried
Editor

Sackville, New Brunswick — A career built on mud. Barefoot commutes through knee-deep mud. Ending a day of work covered in mud, when “freshening up” means dumping buckets of water over your head. “From June to September [each year] I lived on the mud flats,” says wildlife biologist Peter Hicklin, a 20-year veteran of the Canadian Wildlife Service (CWS).

Hicklin has spent those seasons studying the two- to two-and-a-half million semipalmated sandpipers that migrate to the Upper Bay of Fundy from Alaska and Labrador each year. There, they feed voraciously for several days on tiny mud shrimp called *corophium*, doubling their weight in preparation for their 7,400-mile/4,600-kilometer flight to South America.

A consuming curiosity about the unknown drove Hicklin to uncover information about the shorebirds, and about the Fundy mud flats, once thought too dangerous to explore for fear they had the same qualities as quick sand. “The true

pleasure to me is the pleasure of discovery in a most fascinating ecosystem. Much of what we know in the Bay we’ve learned in the last 20 years — but we’re just starting. Almost every day there’s something new that comes up,” he says.

Hicklin began embracing new situations early. An Acadian from northern New Brunswick, Hicklin arrived at Mount Allison University in Sackville, New Brunswick in 1969 speaking only French. To “get a firm grasp” on English, he pursued his first undergraduate degree in contemporary French Literature, combining both languages in his study. He earned his next degree, in biology, at Acadia University in Wolfville, Nova Scotia, writing his honors thesis on seabirds of Arctic Canada in Davis Strait around Baffin Island.

But the mud flats of the Upper Bay of Fundy beckoned to Hicklin in 1977 when he began working as an assistant to Richard Elliot, an Acadia University graduate student and later, colleague, friend, and now his supervisor at the CWS.

Muddy issues

As Hicklin and Elliot studied the sandpipers’ roosting behavior in fields and beaches along the upper Bay of Fundy shoreline, they limited their daily observation time to only the couple of hours around high tide, and they avoided the mud flats altogether.

“Everybody thought then that you’d sink and you’d never come up again,” Hicklin recalls. But his curiosity eventually overtook him. Says Elliot, “He was the first one to really get his feet muddy. You go up to your ankles and even up to your knees trying to walk in the stuff.” But slogging through the sediment in bare feet and shorts proved to be the best way to traverse the gooey terrain, Hicklin found. He learned soon enough that the flats were not, in fact, full of sinkholes waiting to swallow up hapless scientists. But he was sucked in, nevertheless — intrigued by the enigmatic ecosystem. He decided to make it the subject of his master’s degree work at Acadia University.

When CWS asked Hicklin to project the potential effects on the sandpipers of a proposal to dam the Bay of Fundy and build turbines to provide electrical power

to all of Atlantic Canada, he says, “I made it very clear it would have a significant impact.” A dam would have altered the sediments in the Bay, affecting the *corophium* on which the birds feed. Also, said Hicklin, “The bay is one big bowl of red mud,” and its sediments would have blocked the turbines completely. Hicklin was later offered a position at CWS where he continued his research.

Spending most of every summer in the field, Hicklin observed the semipalmated sandpipers and banded them (22,744 in all) so they can be tracked to see how environmental changes are affecting the birds and their use of habitat. Most of the banded birds were also tagged with a leg-flag to identify them as Fundy shorebirds. Later sightings at their wintering grounds in Surinam (Dutch Guyana) on the northeast coast of South America, and on a spring migration through the Great Plains, confirmed their circular migration pattern for the first time.

remembers photos of them. “All you can see is eyes.”

Now, field research on sandpipers has expanded, and two hemispheric reserves have been established for the species — one in the Bay of Fundy, and one in Surinam. With so much other research going on in the field, “I don’t need to be there 24 hours a day,” Hicklin says.

Visionary Award winner

Last winter, the Gulf of Maine Council presented Hicklin with a Visionary Award in recognition of his efforts on behalf of the ecology of the Upper Bay of Fundy. Pleased and surprised by the praise, Hicklin also credited long-time residents along the Fundy shoreline with playing a valuable role in his research by sharing their observations about changes they see taking place in the environment.

Hicklin hopes to arrange forums where farmers, naturalists, clam diggers, fishermen, and others who have lived and



Semipalmated sandpiper

Photo: Mary Anne Bennett

“Everything I was doing was new. It was intense and exciting,” says Hicklin. Elliot clearly recalls him sitting, like a misplaced vacationer, in a lawn chair he’d haul out to the flats, looking through a telescope at the sandpipers foraging close by. “The birds will come within 10 to 15 feet [three to five meters] if you’re very still,” Elliot says. On other occasions, Hicklin and his field crew would return from the flats encased in mud, having spent the day collecting sediment samples with a coring device. Elliot

worked around the upper Bay of Fundy can discuss changes in landscape. “Those are observations that are very valuable. It gives us an idea of where to focus,” he says.

These days, Hicklin is mired in paper more often than mud, spending most of his time in the office compiling his research on sandpipers, and setting up research plans for white-winged, surf, and black scoters. These sea ducks stop in the Bay of Fundy to fuel up during their spring migration south and fall migration north. All three populations are declining, and scientists don’t know why, says Hicklin, noting that the US and Canada are about to undertake a new joint venture to study and protect the birds.

Tiny shrimp plays big role

Though Hicklin no longer spends most of his time in the field, he continues to be fascinated by *corophium* and its important role in the region’s ecosystem. The mud shrimp provide summer feeding for 95 percent of the world’s population of semipalmated sandpipers. Additionally, the shrimp that the sandpipers don’t eat decompose and the resulting nutrients enter the bay, supplying the whole food web, says Hicklin.

Corophium also help stabilize the mud flats. As they tunnel through them, they enable oxygen to enter the sediments. This provides a hospitable environment for single-celled algae, or diatoms, that grow between the mud particles and produce an organic chemical that binds the grains together, creating a firm mud flat in which the *corophium* can live. “A lot of it [the sediment] would be kept in suspension in the tides if not for the algae,” Hicklin explains. The algae also serves as a food supply for the mud shrimp. Hicklin finds the structure exquisite. “It all works so well together — nature is such a fascinating system. It works a lot better than we do.”

Photo: Stephen Homer



Semipalmated sandpipers visit the Bay of Fundy’s mud flats each summer where they feed on *corophium* — tiny mud shrimp — before making the long trip to South America for the winter.

Eelgrass

Essential or expendable in the Gulf?

By Suzy Fried
Editor

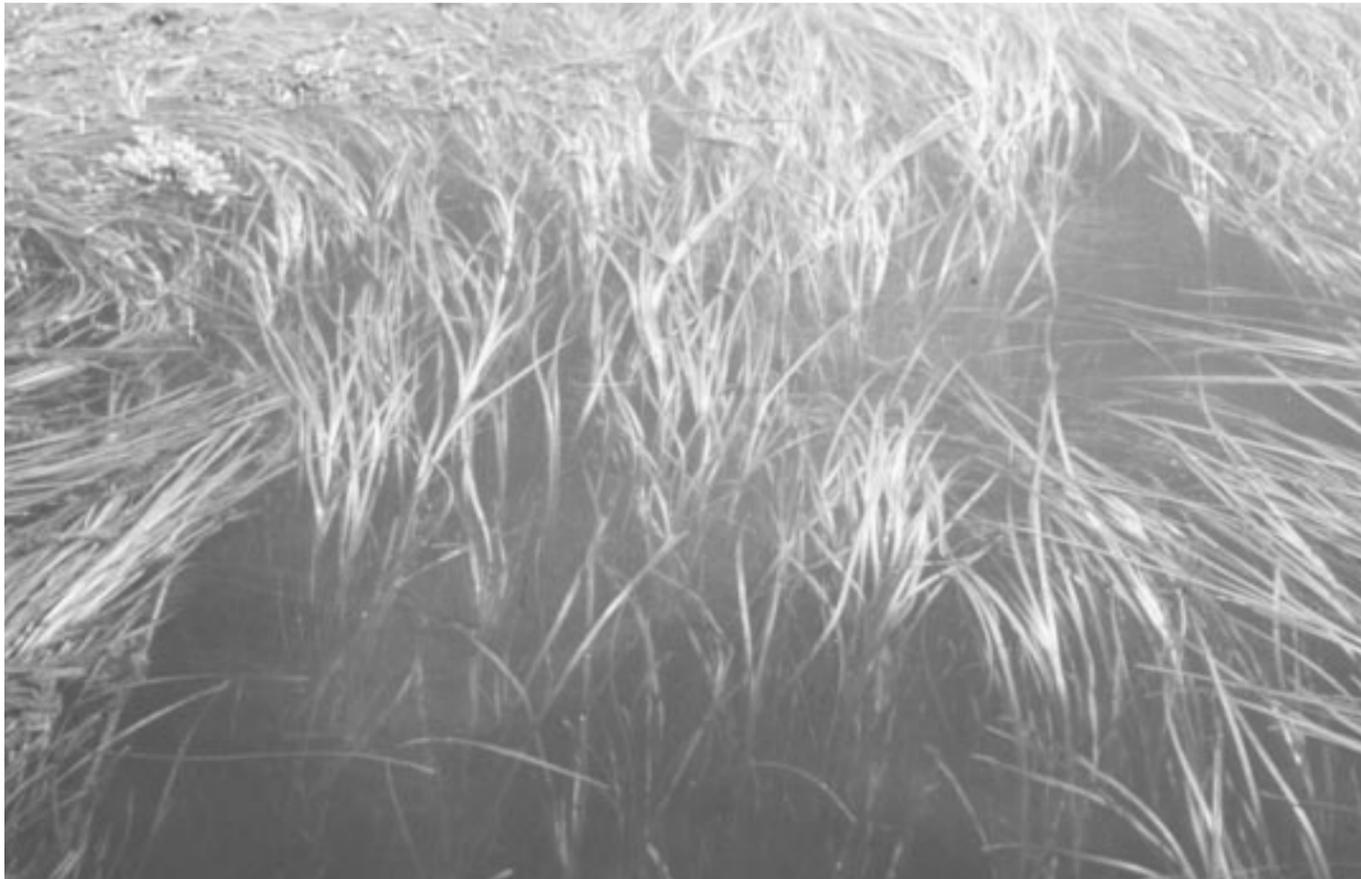
Gulf of Maine — Reaching up through the shallows along the Atlantic coastline from North Carolina into the Canadian maritimes are long, thin, bright green blades of *Zostera marina*, or eelgrass. Some scientists maintain that the plant's value to the ecosystem and to fisheries warrants its preservation. But a question remains whether singling out eelgrass for protection means that other equally valuable marine habitats will suffer.

A type of seagrass that grows in beds anchored to the marine floor by intricate root systems, eelgrass reaches lengths of up to five feet. Protected coastal areas — tidal rivers, bays, and estuaries — that are completely covered with water and have fine-grained sediments provide the best growing area for eelgrass, which also requires light and water clarity for photosynthesis, and moderate waves and currents that prevent stagnation without uprooting the plants. Beachcombers frequently find dried, black, tangled masses of eelgrass washed ashore, marking the high tide line.

Eelgrass protection proponents say the plants serve as refuge and nursery for juvenile finfish and shellfish, and as food for fish, invertebrates, and waterfowl. They note that the plants produce oxygen needed by other organisms; filter contaminants and absorb nutrients that can cause excess growth of algae; and stabilize sediments with their root systems, helping to prevent erosion.

But while Bob Steneck, a professor at the University of Maine School of Marine Sciences, agrees that eelgrass is an important habitat, he is not convinced it takes precedence over others in all parts of the Gulf. "What I get concerned about is if you are protecting one habitat or one community, then, defacto you are possibly focusing some of the environmental stresses on the others. I don't think there's a compelling biological argument that places the role of *Zostera* above the roles of [kelp and cobble beds]," as important habitat, he said.

Seth Barker, who is mapping eelgrass for Maine's Department of Marine Resources, said, "We really, in the Gulf of Maine, consider the question of the relative importance of eelgrass as still an open issue."



Eelgrass grows in many coastal areas of the Gulf of Maine and is protected in the US by federal regulations. Restoration projects have been completed or are under way in several locations where eelgrass has been lost due to development or other factors.

Experts debate protection

Steneck asserted that eelgrass received federal protection under the US Clean Water Act — which requires that any eelgrass destroyed by human activity be replaced or restored — because of its role as essential fish habitat in the mid-Atlantic, not the Gulf of Maine. "Something that could be absolutely essential along much of the east coast may not be essential everywhere," he said. If eelgrass were crucial to the survival of fish in the Gulf, devastating results would have occurred in the 1930s, when 90 percent of the eelgrass beds in the North Atlantic region were destroyed by a marine slime mold known as the mass wasting disease, Steneck stated.

"There is data to suggest that the great dieoff in the 1930s resulted in wildlife loss," argued US Environmental Protection Agency (EPA) marine biologist

Phil Colarusso, who organizes an annual meeting of New England scientists and researchers studying eelgrass and working on restoration projects. Populations declined among bay scallops, brant geese, and the eelgrass limpet, which "went extinct as a result," he said, noting, "Since none of these are very commercially important anymore, people tend to discount them."

Colarusso asserted, "We're not sacrificing other habitats to protect eelgrass. We're all for protecting macroalgae and cobble and some of these other habitats." He said Steneck is "taking ecological principles that have been demonstrated all over the globe and saying they don't apply in Maine."

Steneck maintained that the importance of certain habitats does vary in different regions of the Gulf. Along Maine's rocky coast, habitats that are more struc-

turally complex than eelgrass — including kelp beds, boulder fields, and cobble beds — support more organisms than eelgrass does, making them more valuable than eelgrass for coastal food webs in that region, yet they are not federally protected, he explained. "*Zostera's* importance as a habitat is likely to be greater from Cape Cod south, where it provides most or all of the habitat complexity in many marine systems," Steneck said.

Threats to eelgrass numerous

According to Fred Short, a University of New Hampshire scientist who is a consultant for eelgrass restoration projects in New Hampshire, Maine, and Massachusetts, the decline of eelgrass by 50 percent along the North Atlantic Coast during the past century has been caused by numerous factors, particularly "nitrogen loading," in which nitrogen-rich nutrient runoff from agricultural land, discharge from sewage systems, and leaky septic systems flows into coastal waters, in effect fertilizing them. This increases the growth of phytoplankton and other vegetation, blocking the light eelgrass needs for photosynthesis, and, as it decomposes, robs the water of oxygen needed by other organisms — a process called eutrophication.

Boat propellers and recreational skiff stir up sediments in the water, and these also block light. Propellers, mooring chains, and some types of fishing gear can uproot or crush eelgrass, and dredging and shoreline development of terminals and piers can tear up eelgrass beds.

Eelgrass is also vulnerable to the long-term effects of docks, moored boats, and other structures that shade the plants from the light they need.

Researchers lack information on how eelgrass is affected by chemically pressure-treated wood, lobster pounds, and pipelines laid under or along the surface of the ocean floor, but Colarusso said people can reduce known threats by making sure that sewage and septic systems are functioning properly; using fertilizers and pesticides sparingly, especially before a heavy rain; using dinghies to



Eelgrass can be harvested from prolific areas and transplanted to other sites, however predators and other disturbances sometimes uproot or destroy the transplanted shoots.

Fishery research

Continued from Page 1

of several extensive databases that NMFS scientists use to determine the abundance and survival rate of fish that are mature enough to be harvested; the geographic distribution of species; how plentiful their food supply is and whether it is changing; their spawning patterns; ecosystem changes that may affect them; and whether their populations are increasing, decreasing, or holding steady.

The research/management link

"The assessments themselves result in advice to managers about what is happening with the stock. It's up to managers to decide what to do about it," said Teri Frady, NMFS Chief of Research Communications.

One of the most troublesome findings scientists may encounter in their research is that a stock has been over-fished. NMFS' September 1997 report to Congress on the status of US fisheries listed 86 species as over-fished and 10 species as approaching over-fished status based on the criteria specified in the Magnuson-Stevens Fishery Conservation and Management Act of 1976. The Act, reauthorized in October 1996, mandates that NMFS rebuild over-fished stocks and protect and enhance essential fish habitat.

Regional councils manage US fisheries in accordance with the Magnuson-Stevens Act. Of the 26 stocks under the New England Fisheries Management Council's (NEFMC) geographical area of authority, 12 are classified as over-fished, and two others are approaching over-fished status.

In 1984, New England fishermen landed about 96 million pounds of cod



Fisherman Willie Amaro repairs a trawl net aboard *Albatross IV*. Survey cruises weather many of the same problems commercial fishing vessels encounter at sea, including losing nets to a rocky ocean floor.

Photo: Suzy Fried/Gulf of Maine T

(43,439 metric tons). By 1996, landings decreased to about 31 million pounds (14,197 metric tons) due to declining stocks. This prompted scientists to recommend a 63 percent reduction in cod takes, which NEFMC has implemented for this year's Gulf of Maine cod catch.

For most species, the definition of over-fishing is based on the number of mature fish killed by fishing (mortality rate), but according to Steve Murawski, chief of NEFSC's Population Dynamics Branch, considering stock level along with mortality rate gives a more accurate picture of a stock's status.

For example, on Georges Bank, even though closures have lowered mortality rates, the stock level remains low as a result of past over-fishing. In this case, basing management decisions only on improving mortality rates would overlook the fact that the stocks are still depleted.

Murawski noted that NMFS is in the process of revising guidelines for defining over-fishing.

Elbow-deep in data

On leg four of the spring groundfish survey, at stations selected to provide a representative sampling of the Gulf's depth zones and geography, scientists collected information on food habits, population distribution, and stages of maturity. The trawl net used on research surveys has a finer mesh than a commercial fishing net, allowing smaller, younger fish to be caught, providing information about the number of fish likely to enter the fishery as they mature — but NEFSC scientists emphasize that their survey procedures have been developed to minimize the catch taken on

Volunteer for a survey cruise and 'sea' for yourself

Woods Hole, Massachusetts — "Grandma's house has stairs, ships have ladders." Maybe this isn't the most important information I brought back with me after a week aboard the *Albatross IV*, but it's the sort of seagoing turn of phrase that sticks with a first-time sailor just the same.

I signed up as a volunteer on the final leg of the National Marine Fisheries Service (NMFS) spring groundfish survey in the Gulf of Maine to get a first-hand look at how scientists collect information used in assessing stocks for fisheries management. I wanted to glimpse life at sea. I got an eye full, though good weather and quick progress cut our trip from two weeks to one.

My future father-in-law began calling me "Old Salt" weeks before my departure, but the truth is, until the *Albatross IV* (a 187-foot/57-meter stern trawler) pulled away from the dock in Woods

me. Accustomed to working with green participants (in more ways than one) on these trips, the scientists and crew members aboard *Albatross IV* were infinitely patient and supportive.

The romance of the open ocean can be palpable. Sky, wind, and water create moments of poetry to be collected and brought home like seashells. Frequently, striking forms of marine life — unusual starfish, anemones, and other creatures — appeared in our catches. And living in what seems a sort of floating village adds another dimension to the trip. As NEFSC scientist and veteran sailor Linda Despres, says, "You get to know people on an intimate basis. You don't have the influence of television out there. You really get to talk to people. You're looking your worst and feeling your most vulnerable. It's a very interesting experiment out there."

Despres sees survey cruises as a form

in the repetitiveness of scientific sampling. But occasional surprises relieved the monotony. The Tuesday after Easter, we discovered the remains of a holiday ham dinner in a hake's belly — a source of great amusement among those of us teetering on the edge of sleep-deprivation.

Unglamorous though the work may have been, *Albatross IV* featured creature

comforts that many career mariners must leave ashore. Movies and e-mail helped pass the time between six-hour watches and survey stations. And first-rate meals inspired those of us still getting our sea legs to move past the crackers-and-gingerale stage — until even the least-seasoned among us handled the swells like an Old Salt.

To learn more ...

about NEFSC survey cruises, contact John Galbraith at (508) 495-2392 or visit <http://www.wh.who.edu/nefscnf.html> the NEFSC web site.

Hole on April 13, my seagoing experience had been limited to day-long nature cruises. But when I joined my watchmates on a rolling deck, bundled in layers under our Helly Hansens, picking shrimp and herring out of a pile of mud hauled up in a trawl net from the night-time waters somewhere off the coast of Maine, I felt I could say with a much straighter face that I'd been to sea.

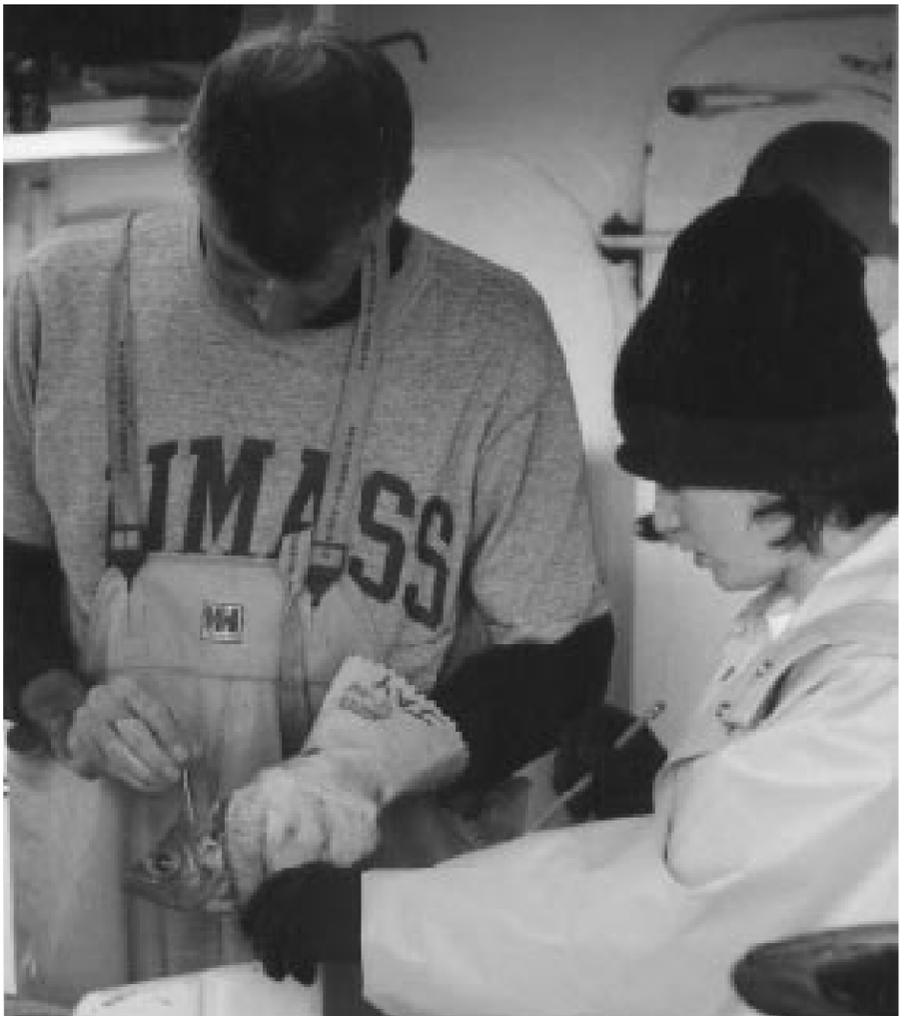
Students, writers, researchers, and others with a taste for salt air have taken advantage of available berths on Northeast Fisheries Science Center (NEFSC) surveys along the Atlantic coast and in the Gulf of Maine. Participants in our trip included Joe Kunkel, a University of Massachusetts researcher studying cod populations; Dan Doolittle, a frequent volunteer, and self-described "kid with a science degree looking for work in New England"; and

of escape. "You eat, sleep, and work. It's reduced to the basics. You don't worry about money, you don't worry about how you look." She finds that her time at sea has helped her clarify priorities at home. "I like to keep things simple."

But a survey cruise is not a luxury vacation. Warmth and water-resistance become primary wardrobe considerations. Tossing and turning in your sleep takes on a new significance, even in relatively calm seas. And the hours of sampling work can be tedious and grisly.

While "recorders" log the pertinent information, scientists working as "cutters" measure fish, weigh them, and slice them open. Stomach contents are examined and scales and certain bones are removed for further scrutiny back at NEFSC's Woods Hole lab.

A recorder myself (new sailors usually get this assignment), I became immersed



John Burnett (left) of NEFSC's Woods Hole lab collects otoliths (bone-like material that indicates the age of a fish) to be examined at the lab for age and growth information. Stacy Burgh of NEFSC's Milford, Connecticut lab assists with sampling and logs information.

Photo: Suzy Fried/Gulf of Maine T



(From left) Dan Doolittle, Vaughn Silva, Elizabeth O'Neill and John Burnett sort the catch during the fourth leg of the Northeast Fisheries Science Center's spring groundfish survey in the Gulf of Maine.

research cruises while still allowing them to get a representative sampling of species.

At each station, following a 30-minute trawl, the catch was sorted by species into plastic buckets and bushel baskets. The scientists and other participants on board worked in pairs, in which a "cutter" examined the fish, and a "recorder," wrote down the information on waterproof log sheets.

While lobsters and crabs were measured and released, almost every other fish caught was measured, weighed, and tallied, and a representative sampling of each species was examined further for information on gender, reproductive maturity, and, in some cases, stomach contents.

From many of the fish, scientists also removed otoliths, small bone-like structures in the fish's head that grow new layers as the fish ages, much as tree trunks grow new rings. Otoliths provide valuable information on a fish's age and growth history. In some cases, scales can also provide this information, as can other bones, and these may be collected instead.

As watch chiefs, NEFSC biological technicians John Galbraith and Vic Nordahl reviewed their team's log sheets for accuracy, and Nancy McHugh, chief scientist for the cruise, reviewed them again. Paid prison inmates enter the logged information onto computer disks that are later transferred into NEFSC's database which, according to NEFSC fisheries biologist Linda Despres, also contains a system of checks to help catch errors that may have been made at sea or during data entry.

Along with providing stock assessment information, survey cruises are an opportunity to collect special samples for other researchers' projects, and to bring back shrimp and herring for the fish and seals at Woods Hole Aquarium. Some live specimens — starfish, anemones, and fish — are also brought home to be exhibited at the aquarium.

Assessment incorporates other data sources

Fish stock assessment draws on other resources in addition to NEFSC's scientific surveys, including fishery surveys conducted by individual states and by Canada. According to Stratias Gavaris, fisheries scientist at the Canadian Department of Fisheries and Oceans (DFO), that country's methods of collecting and analyzing information and making recommendations to fisheries managers is very similar to that in the US. NMFS and DFO jointly evaluate the status of shared stocks, and before putting management policies into place, each agency brings its recommendations before the public.

Records of fish landed by commercial fishermen are also a valuable source of information in assessing fish stocks but do not provide all the information needed, said Frady. Several fishery management plans require that fishermen document landings of certain species, but there are inconsistencies in reporting, she noted.

Also, fishermen's logs provide information on fishing "hot spots," which are not necessarily representative of the fishery as a whole. And commercial logs are more likely to include information on marketable species than for species that are less commercially valuable.

In addition, fishermen are continually updating their equipment and methods, and increased landings could reflect greater fishing power rather than changes in the actual fish stocks themselves. Survey vessels, on the other hand, use the same methods they have for years, and the equipment has not changed much, so data collected on them can be compared directly from one year to the next, Frady explained.

The Commonwealth of Massachusetts has argued against basing fishery management decisions on reported commercial landings. According to the

Massachusetts Division of Marine Fisheries (DMF), because recent regulations have increased mandatory reporting requirements, records show more fish are being landed when that may not be the case — only that more landings are being documented.

But DMF says the perception that more fish are being landed is leading to quotas that are set too low. Massachusetts successfully sued the Secretary of Commerce and the Director of the National Marine Fisheries Service charging that a quota on scup was based on inaccurate and incomplete records of

scup landings in the state.

Frady said NMFS is considering an appeal. She said the quotas were based on available information. Should more figures come to light, NMFS can revise the scup management plan, she said.

Though NMFS has had its share of critics, a recent independent review of its research methods by the National Research Council has validated the science behind NEFSC's stock assessments. "Scientists collect the same type of data each time," said Frady. "The more information you have, the better the assessment you can do."

Nina Shepherd

Charting her own course

Falmouth, Massachusetts — As punishment for breaking her curfew as a teenager, Nina Shepherd's dad, Fred Nichy, would bring her to work with him at the Northeast Fisheries Science Center (NEFSC) lab in Woods Hole early on weekend mornings. "I hated it at the time, because I wanted to sleep late. But he showed me all the techniques — more than what he did in the kitchen."

The first chief of the NEFSC's age and growth unit, Nichy often worked on his specimens at home. It would seem that Shepherd, now a marine biological science technician and 12-year veteran of the unit, didn't stand a chance of keeping her distance from the "family business." Not that she wanted to. "I wanted to grow up and be like my dad and do what my dad did."

Shepherd frequently sails on NEFSC survey cruises, collecting samples to be analyzed by biological technicians including herself, for information about certain species' growth patterns, food habits, and reproductive activity. Spending weeks cutting open fish after fish can be wearing, but, "it's all for good science," she said. As she took time to point out interesting characteristics of the fish being sampled aboard *Albatross IV* during the final leg of the Gulf of Maine groundfish survey, it was obvious that the creatures still fascinate her.

And, while the survey cruises are a job requirement, ultimately, the 40-year-old Cape Cod native goes to sea because she can't stay away. "This is something I really love," she said. Even when she returns home to Falmouth, Shepherd is likely to spend time on or near the water, combing a marsh in search of fishing bait, or digging for clams and quahogs on the beach.

Her affinity for the ocean started at an early age. When other nine-year-olds got paper routes, she started shellfishing, and had her own boat at age 12. She used her income to support her other hobbies, mostly animal-related, including raising beagles and caring for the pony her father brought home one day in the back of a VW microbus.

But as drawn as she is to the water, Shepherd also relishes coming home to spend time with her daughters, 18-year-old Malika and 13-year-old Novina, and to see friends, work in her garden, and teach her dogs to hunt. She hopes to add a horse to her family again, "maybe once my kids are both through college."

Though Shepherd grew up in Falmouth, practically next door to the NEFSC lab at Woods Hole, she took a long, circuitous route to her current job — through the southern and western US as a rider on the amateur rodeo circuit, and then across the country, living off of temporary jobs on ranches, in slaughter-



Nina Shepherd

houses, and in onion processing plants. The jobs were "a lot of fun — except for the slaughterhouses," she recalled.

Eventually, Shepherd landed in Monterey, California, and worked for several months on a charter fishing boat, doing double duty as a crew member — the first woman crew member hired in San Francisco Bay — and, more traditionally for the 1970s, as a waitress.

Her crew-mates treated her as an equal, thanks largely to her work ethic and sense of humor, but the paying customers weren't as progressive. "They were quite taken aback to see I could wield a fillet knife," in addition to fetching beer, she laughed.

After a couple more trips back and forth between coasts that included a brief marriage, helping to establish a mountain community in Big Sur, and working as a landscaper, Shepherd eventually returned to settle on the Cape with her two young daughters.

One day, when she was working at the local Woolworth's, the supervisor of the NEFSC age and growth unit came to encourage her to apply for a biological aide position there. "I just really lucked out having the background that my father gave me and being in the right place at the right time."

But for all her talk of luck, Shepherd sets her own course. Having postponed college earlier in her life, she's now completing her bachelor's degree in marine biology. And although her amateur rodeo days left her with a legacy of aches and pains, her sense of adventure is healthy as ever. "My next goal is to do some skydiving, even though I'm petrified of heights. That's what I've got left to do — finish my degree and jump out of a plane to celebrate."

Ballast water

Continued from Page 1

"The actual process which makes exchanging ballast water at sea effective is, you replace coastal water organisms with [less adaptable] mid-ocean organisms, which are less likely to survive in coastal waters," said Lt. Larry Greene, Aquatic Nuisance Species Control Program manager for the US Coast Guard (USCG).

Invaders can devastate

"A typical ballast tank could be the size of an auditorium that seats 700 people," said Carlton. When ballast water transfer takes place in port, the discharged water can introduce what he described as a "staggering diversity of living organisms," to coastal waters, including non-native aquatic organisms and pathogens, such as cholera.

Not all of these organisms will survive in their new surroundings, but some are extremely hardy, have no natural predators in their new environment, and multiply profusely. Some invasive organisms can become toxic, posing threats to other species, aquaculture stocks, and humans. Non-native aquatic organisms can also crowd out native species by reducing the food supply or changing characteristics of the habitat.

The infamous European zebra mussel's introduction into the North American Great Lakes, and its subsequent spread to central US rivers, has jeopardized commercial and recreational fisheries, and caused expensive infrastructure problems. The mussels consume huge amounts of microscopic plants and animals, reducing available food for other species, and they have become so prolific that power plants and water delivery systems have been forced to spend millions of dollars on removing them from underwater structures and water pipes.

In the Gulf of Maine, the European green crab, European periwinkle, Japanese sputnik weed, and grey and orange sea squirts, are all non-native species. Fortunately, none have caused problems on the scale of the troubles brought by the zebra mussel. Nevertheless, cautioned Carlton, without precautions, "It's only a matter of time until we register a front-page, major invasion in the Gulf of Maine. We are not able to predict what it will mean, so we'd rather it not happen."

Mandatory compliance coming

The International Maritime Organization (IMO) in 1991 adopted voluntary guidelines for preventing marine species invasions via ballast water, and is developing mandatory guidelines that may be approved as soon as 2000, although ratification may take several years.

Meanwhile, shippers entering US ports were given three years to voluntarily comply with open ocean ballast water exchange guidelines under the US National Invasive Species Act of 1996, which is enforced by the USCG. The Act states that shippers should exchange ballast water at sea unless "that exchange threatens the safety or stability of the vessel, its crew, or its passengers." According to Green, mandatory reporting of ballast water exchange will probably begin later this year.

Greene said the USCG is developing an instrument that can differentiate between coastal and mid-ocean water that its officers will use to test ballast water on board ships. If the USCG determines at the end of the current three-year period that the voluntary compliance with the US guidelines is inadequate, mandatory requirements would likely take effect in 2001. Those requirements could be implemented on a regional or national basis, according to Bob Peoples, Executive Secretary of the Intergovernmental



Ships must take on and discharge ballast water as they load and unload cargo in order to remain stable and maneuverable. To reduce the number of problematic foreign organisms brought into ports, the International Maritime Organization and US Coast Guard are urging shippers to exchange their ballast water in the open ocean.

Aquatic Nuisance Species Task Force, established under the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990.

The Canadian Coast Guard and Fisheries and Oceans Canada are evaluating compliance with the voluntary IMO regulations in Canadian Ports. Canada has no national regulations in place, and none that cover the maritime region, according to James Lawson, Senior Regional Pollution Prevention Officer for Transport Canada.

But if IMO's guidelines become mandatory, Canada's federal government will likely issue enforceable guidelines for all of its ports that are similar to those in place on the Great Lakes

and in Vancouver, requiring ships to exchange their ballast water outside of those waters, said Captain Peter Turner, Harbor Master for the Saint John Port Corporation in New Brunswick. He noted that ballast water from ships docking at the Irving terminal there is treated on shore, then discharged.

Greene said the US and Canada have coordinated closely on ballast water regulations for the Great Lakes, and would likely do so for the Gulf of Maine, noting, "It's in the interest of both nations to prevent invasions."

But while Greene described the spread of invasive species as "a global environmental problem," he said, "Our biggest concern right now is the safety of life at sea and whether vessels can safely conduct what we're asking them to do."

According to Collard, "Ships' captains must always consider prevailing navigation and sea conditions, structural safety of the vessel, and resulting stress on the ship's hull from ballast exchange." But he stated that Marbulk complies with all ballast water guidelines, whether voluntary or mandatory. "We're a service-based industry. We can't go polluting places and upsetting the ecosystem. In areas of the globe where standards are lower, we still maintain North American standards," he said.

Some wonder whether ballast water restrictions make ports more or less attractive to shippers. Ron Huber of the Rockland, Maine-based Coastal Waters Project said the Maine legislature considered a bill in 1997 directing the state to join the National Aquatic Nuisance Species Task Force, created by the 1990 Act. Lawmakers, however, worried that implementing more stringent ballast water restrictions in Maine ports might make them "less desirable to shipping."

But Sean Brilliant, Executive Director of Atlantic Coastal Action Program-Saint John, said his group worries that as international quality standards become more rigorous, New Brunswick ports without stringent ballast water plans could be considered less desirable destinations. The group plans to begin sampling the quality of ballast and bilge water entering and leaving Saint John harbor.

Researchers explore remedies

Research organizations are exploring ways shippers can address ballast water issues. Allegra Cangelosi, Senior Policy Analyst and co-principal investigator with the Great Lakes Ballast Technology Demonstration Project, is testing the effectiveness of filtering organisms from ballast water.

Open-ocean ballast water exchange is simply not feasible in all cases due to weather conditions, routing, or a ship's structure, Cangelosi said. "We are in desperate need of more broadly applicable approaches," she said, adding that her organization is "looking for technologies that can be used anywhere on the globe," including the Gulf of Maine.

Battelle Memorial Institute, a not-for-

profit international organization, is also researching ways of treating ballast water as it is pumped onto a vessel to kill the organisms in the water, including ultrasonic treatment, irradiation, and heating the water, said Deborah Tanis, a research scientist based in Battelle's Duxbury, Massachusetts office.

Treating ballast water chemically may also be an option, but Carlton said, "We want to be conservative with biocides and cautious about diverting more chemicals into the system — unless they have a very short half-life and are biodegradable."

Though open-ocean exchanges are currently the accepted method for handling potentially contaminated ballast water, both Tanis and Cangelosi agree that other options are needed. Said Tanis, "We need methods that are more effective than ballast water exchange and more feasible for shippers. We're studying the actual biological effectiveness of exchanges. It certainly will help, but I don't know that it's 100 percent fool-proof. There's a need to bridge the gap between science and industry, and that means we need to come to some determination that benefits both."



Plankton sampling can reveal the kinds of organisms ballast water contains. Researchers are exploring ways to treat ballast water before it is discharged — including filtration, heat, and irradiation — to kill exotic organisms that could invade coastal areas.

Winter harbor cruises get warm reception

Boston, Massachusetts — Exquisite summers in the Gulf of Maine can make you forget about winter entirely, but victims of cabin fever in the Boston area needn't fret when the temperatures drop a few months from now. There are ways to enjoy the colder seasons on the Gulf's waters, even if the only sunscreen you'll need is for the tip of your nose peeking out from under your parka hood.

Each winter for the last 10 years, the Massachusetts Metropolitan District Commission (MDC) has contracted with Boston Harbor Cruises, a private company, to run three monthly wildlife cruises out of Boston and Hingham to Georges Island, about nine miles/14.5 kilometers from downtown Boston. "It's a way of breaking up the winter," said Bill McCormack, MDC site supervisor for the harbor islands.

Times have changed since Boston Harbor's islands were considered little more than a location for activities too unsanitary, unpleasant, or dangerous for the mainland. Last year they were designated a National Recreation Area as part of the National Parks System (NPS). Though 11 private parties own the islands, NPS contributes a dollar in funding for every three dollars raised by the island owners or private contributors for their management.



A winter wildlife cruise in Boston Harbor offers opportunities to see seals, seabirds, and other marine species just a few miles from the Boston skyline.

Seventeen of the harbor's 30 islands are managed as a state park, and eight are open to the public during the warmer months, managed by the MDC and the Massachusetts Department of Environmental Management (DEM).

They are linked with a free water taxi for easy island hopping. Campers can stay overnight at four of the islands.

McCormack explained that MDC closes the harbor islands it manages around Halloween. Except for the three winter cruises, they're not accessible to the public until spring, when a full schedule of cruises, including day trips, overnight camping trips, lighthouse tours, and evening harbor tours are available.

Bring one more layer

It's worth bundling up for a winter nature cruise in the Gulf of Maine. And don't skimp on the gear. When you think you've piled on enough layers, add one more. At least. And keep another in reserve in your day pack.

Wind chill on the water can make a crisp late winter or early spring day downright bone-rattling, especially once you're beyond the protected inner harbor. Unlike a winter hike or ski trip, which keeps you moving and your blood flowing, your physical activity on a nature cruise is mostly limited to keeping your balance on deck while peering through binoculars at lounging harbor seals. There's nothing wrong with an occasional break below deck to warm up, but if you end up covering there the whole trip, you've wasted the price of your ticket.

On the last cruise of MDC's winter season — rescheduled to April 4 thanks to

a first-day-of-spring snowstorm that brought 15-foot swells — passengers were treated to frequent glimpses of common eiders, harbor seals, and double crested cormorants. The various wildlife were pointed out by a naturalist and described in chunky handouts.

Other points of interest in the harbor included several lighthouses; Boston's new sewage treatment plant, credited with helping improve the harbor's water quality; and Nixes Mate, where the bodies of executed pirates were once displayed as a gruesome warning to would-be marauders contemplating a stop in Boston.

Once off the boat, passengers explored George's Island, the site of Fort Warren, a large earthworks that held confederate prisoners during the US Civil War. Winter cruisers have the option of picnicking on their own, or taking a guided tour, soaking up information about the coastal flora and fauna including what sea urchins eat and how to make a tasty, tart beverage from the berries of the Staghorn sumac.

Offering winter cruises to the outer harbor reminds people of the natural and cultural resources available to them, and



Binoculars and lots of layers are essential for an enjoyable winter wildlife cruise.

part of the proceeds from the winter cruises supports MDC's summer programming, said McCormack. "It's been pretty well accepted [all along]," he noted. "But now that the National Parks Service is involved, more people are finding out about these hidden treasures that are located less than one hour from the city itself."



The most enthusiastic of nature observers enjoy the view from the deck, but an occasional trip below to warm up is no disgrace.

Eelgrass

Continued from Page 5

access boats rather than building piers and docks or dredging deeper channels; and orienting piers to reduce the amount of shade they throw over eelgrass beds.

To help people build eelgrass-friendly piers, Short produced a CD ROM, funded by the Waquoit Bay Estuarine Research Reserve, Sea Grant, the National Oceanographic and Atmospheric Administration (NOAA), Massachusetts Coastal Zone Management, and UNH. *Dock Design with the Environment in Mind* outlines guidelines for building eelgrass-friendly docks.

Doug Burdick, environmental specialist at the Maine Department of Environmental Protection, said that while effects on eelgrass are considered as part of an extensive permitting process used for larger waterfront development projects, most privately-owned piers are reviewed under a shorter process that does not directly address eelgrass.

Steneck believes regulatory protection of eelgrass is well-intentioned, but said, "sometimes the regulations can move us in an imprudent direction." He recalled Maine Governor Angus King as citing

eelgrass protection as the deciding factor in the state's decision two years ago to shelve a cargo terminal proposed for Sears Island in Penobscot Bay. Richard Bostwick, Supervisor of Environmental Studies within the Maine Department of Transportation's Office of Environmental Services, said "Eelgrass was one factor out of many that put [the original proposal] over the edge and helped put the project on hold."

In most cases, according to Colarusso, projects are modified rather than relocated to avoid damage to eelgrass beds, however the state is now planning to upgrade the existing port at Mack Point, across the harbor from the proposed cargo terminal site. Steneck worries that the new location may endanger a cobble bed that serves as a lobster nursery ground.

Restoration piecemeal, but progressing

Scientists in the Gulf of Maine use aerial surveys to inventory eelgrass beds, while in the US, eelgrass restoration projects involving transplanting of seedlings and shoots are under way in several areas, as researchers can find funding for them. Eastern Canada is not working on eelgrass restoration, according to Glyn Sharp,

Marine Plant Biologist for the maritime region of Canada's Department of Fisheries and Oceans (DFO), who stated, "In general our areas are very stable." But, Sharp pointed out, "DFO does have a fish habitat protection act, so if people wanted to dig a big canal or fill in big shallow areas of *Zostera*, the alarm would go off. It's not a free-for-all."

Eight acres/about three hectares of eelgrass beds have been restored in New Hampshire so far with help from EPA funds, and the New Bedford Harbor Trustee Council provided a grant for eelgrass restoration in New Bedford harbor as part of a harbor cleanup, Short said, noting that small-scale transplanting took place in Maine on a trial basis in the mid-

1980s.

"We're getting better at it. I would say we're very successful now. We've developed a site selection model that allows us to go into an area and determine how suitable it is for planting," said Short. But while restoration appears to be working, it can be problematic. Ice, exposure, and predators such as crabs and worms threaten newly planted eelgrass shoots, and hiring specially trained divers to transplant shoots harvested from more prolific areas is expensive. Short said that he and other researchers are working on developing cheaper methods that stewardship groups can undertake. Ultimately, he said, "We want to create an overall visible impact on the estuarine system."

More information on eelgrass

Eelgrass and Fisheries in the Gulf of Maine • Booklet produced by the Island Institute (207) 594-9209

The Importance of Eelgrass • Brochure produced by state of Maine agencies
Maine Department of Marine Resources (207) 287-3261

Dock Design with the Environment in Mind: Minimizing Dock Impacts to Eelgrass Habitats • CD ROM produced by Fred Short at UNH's at Jackson Estuarine Lab E-mail Fred Short, fts@christa.unh.edu

Information on other essential habitats for commercially important species is available from Bob Steneck via e-mail at steneck@maine.maine.edu or by calling the University of Maine Sea Grant office at (207) 581-1435.

GULF LOG

Photo: New England Aquarium



Canada is working on a recovery plan to protect the endangered North Atlantic right whale, according to Jerry Conway, co-chair of the Canadian Right Whale Recovery Team and a marine mammal advisor for Canada's Department of Fisheries and Oceans. The team hopes to complete a draft plan by late June, with the goal of having a federal recovery plan in place by next year. In the US, the species is protected under the federal Endangered Species Act and Marine Mammal Protection Act, but Canada has no federal regulations protecting whales. Scientists believe only about 300 right whales are living today, following years of hunting in the past.

Fast ferry provokes whale concerns

Yarmouth, Nova Scotia — A high-speed ferry proposed to shuttle passengers between Yarmouth, Nova Scotia, and Bar Harbor, Maine at speeds of 45 knots has raised concerns about potential collisions with endangered North Atlantic right whales migrating through the Bay of Fundy.

The 295-foot/91-meter vessel can carry 240 vehicles and 800 passengers, and will make the Yarmouth/Bar Harbor crossing in about two and a half hours, operating from late May through early October, according to John Cormier, vice president of operations and human resources for Bay Ferries, based in Charlottetown, Prince Edward Island.

"It's a massive catamaran," said Jerry Conway, a marine mammal advisor at the Canadian Department of Fisheries and Oceans (DFO). "We're very cognizant of that environmental concern," said Cormier. "We've employed a mammal expert to assist us in developing anything possible to prevent coming into contact with whales in that area," he said. Conway met with Cormier and Bay Ferries marine mammal consultant Ralph Davis in April to discuss the issue.

Canada has no federal regulations currently in place to protect whales. Only about 300 North Atlantic right whales, hunted to near extinction in the past, are

believed to exist today.

Some high-speed ferries already operate in Massachusetts, where a new Boston/Salem route is being proposed. A study on Massachusetts ferries prepared for the Executive Office of Transportation and Construction last summer by Boelter & Associates, Inc. stated that high-speed ferries can maneuver to avoid whales just as they can to avoid small craft in busy harbors.

But according to Charles "Stormy" Mayo, senior scientist at the Center for Coastal Studies based in Provincetown, Massachusetts, "any vessels traveling at relatively high speeds, say at higher than 20 knots, might not have an opportunity to see a right whale" in time to alter their course, as the mammals can dive for up to 25 minutes before resurfacing.

Mayo explained that whales are closest to Massachusetts shores in the late winter and early spring, before seasonal ferries begin their runs. But, he added, whales are not completely predictable. "Right whales will come right into harbors," where ferries travel, he said.

Bay Ferries' proposal is especially troubling because of the vessel's size and because of its route through a part of the Bay of Fundy used heavily by migrating whales, according to Mayo, who stated, "Last year the Bay of Fundy was reported to have had two thirds of the remaining right whales of the North Atlantic in it.

The potential conflict there is considerable and deserves attention."

Maine highlights IYO events

Augusta, Maine — Visitors and residents of Maine can keep up with International Year of the Ocean (IYO) events taking place in that state with a poster and web site created by the Maine Coastal Program, the Maine Sea Grant Program, and the Wells National Estuarine Research Reserve.

Distributed to town libraries and other locations, the poster lists 28 events taking place during 1998, which the United Nations has declared the International Year of the Ocean to promote the understanding, exploration, sustainable use, and conservation of ocean resources.

The web site, found on the Maine State Planning Office home page (www.state.me.us/spo), includes a calendar of events, facts about the world's oceans, available publications, and information on how individuals can help protect ocean resources. There are also links to other IYO web sites.

NHEP maps assist coastal planners

Portsmouth, New Hampshire — The New Hampshire Estuaries Project (NHEP), in conjunction with local planning, land use, water quality, and wildlife experts, has produced maps that identify critical lands threatened by development in 19 coastal communities.

The objective of the project is to identify lands that have high natural resource value and also are favorable for development to assist groups working on land protection. Municipalities including Durham and Rye are already using the maps for development planning and natural resource protection.

For more information call Chris Nash at NHEP, (603) 433-7187.

Dead blue whale leaves scientific legacy

Middletown, Rhode Island — The first blue whale carcass recovered for examination on the Atlantic coast since the turn of the century is expected to provide a wealth of information to scientists.

National Marine Fisheries Service whale biologist Phil Clapham said the body was caught against the bow of a tanker that pushed it into Narragansett Bay March 3. Clapham said that ship could have run into the whale after it was already injured or dead, likely as a result of a collision with another ship. Official word on the whale's cause of death was still to be announced as of May 2.

The necropsy of the 65-foot/20-meter whale, which weighed 40 tons/36 metric

tons, was coordinated by the Mystic Aquarium in Mystic Connecticut and included specialists from several research organizations. Clapham said genetic analysis of the dead whale will help with studies of blue whale population and anatomical characteristics. The skeleton and skull were taken to the New Bedford, Massachusetts whaling museum.

According to Clapham, the young male was not especially large for a blue whale, which can grow up to 90 feet/27 meters long in the North Atlantic and over 110 feet/34 meters in the Antarctic.

Though the species has been protected by US regulations and international treaties for years, hunting of blue whales earlier in the century reduced their numbers to dangerously low levels. Scientists don't know exactly how many blue whales are living today. "Despite the fact that this is the largest animal that has ever lived in the history of the world, finding them is really not that easy," because of their far-ranging travels, Clapham explained.

MA pushes better access around Boston Harbor

Boston, Massachusetts — A "Harbor Walk Enforcement Initiative" announced by the state Department of Environmental Protection (DEP) earlier this year will ensure that waterfront property owners comply with public access laws and remove hazards preventing people from using and enjoying the Commonwealth's shoreline.

On announcing the initiative, DEP named 15 waterfront property owners who are in violation of the state's public waterfront access law and are required to fix dilapidated piers, repair damaged sea walls, and make other improvements.

"As Boston Harbor comes back to life, more and more people will want to enjoy the waterfront," said Trudy Coxe, Secretary of the Massachusetts Executive Office of Environmental Affairs. "The public is paying for the harbor cleanup, and now it's time for people to get a return on their investment and get out there and enjoy the beauty of the waterfront." The City of Boston is also working with DEP to fix portions of the Harbor Walk.

Correction

The byline was accidentally omitted from a story on page 9 of the March 1998 *Gulf of Maine Times*, "Constructed wetlands revive dike-lands." The story should have been attributed to Christopher Cornelisen of Massachusetts Coastal Zone Management. The editors sincerely regret the error.

Gulf Calendar

Fish Aid Festival

August 14-16, 1998

Outdoor music festival to raise funds for marine research.

Yarmouth, Nova Scotia www.trico.ns.ca/fishaid/

Phone 1-888-929-2252 E-mail fishaid@istar.ca

Coastal Zone Canada '98

August 30-September 3, 1998 <http://www.ios.bc.ca/ios/czc98/>

Fax (250) 721-8774 E-mail czc98@ios.bc.ca

Georges Bank Review hearings

Fall 1998

Public hearings on petroleum exploration and drilling on Georges Bank.

Halifax, Nova Scotia; other locations TBA

<http://ycn.library.ns.ca/georges/> Phone 1-800-370-2282



Photo: Brian Chmielecki

The blue whale recovered and brought ashore in Rhode Island in March will provide valuable information to scientists.

Council Currents

News from the Gulf of Maine Council on the Marine Environment

Council hosts shipping forum

Salem, Massachusetts — Shipping industry representatives and marine environment experts were scheduled to meet here June 4 at a day-long forum sponsored by the Gulf of Maine Council on the Marine Environment to exchange information on two emerging issues: collisions between ships and endangered North Atlantic right whales, and the introduction of exotic species into ports via ballast water (see story on page 1 of this issue of the *Gulf of Maine Times*).

The forum was intended to raise awareness among port operators, shipping

agents and owners, maritime universities, the military, and environmental organizations, of the latest developments in addressing these issues in the Gulf of Maine, and the potential for partnerships among the parties involved. The forum also presented an opportunity for maritime industries to give their perspective on the challenges inherent in addressing right whale and ballast water issues.

Participants in the discussion were to include representatives of the New England Aquarium's Right Whale Project, the National Oceanic and Atmospheric Administration, the Canadian Department of Fisheries and Oceans, the Center for Coastal Studies, the

Aquatic Nuisance Species Task Force, MIT Sea Grant, the US Coast Guard, the shipping industry, as well as researchers, consultants, and others.

The Council has also co-sponsored production of brochures and posters designed to inform mariners about how to help protect right whales at sea. For copies call (617) 727-9530 ext. 420.

GOMC seeks partners from private sector

Gulf of Maine — The Gulf of Maine Council is seeking business partners to advise the Council and help sponsor research and education programs

throughout the Gulf of Maine region. Current sponsors include Portland Pipeline Corporation, Public Service of New Hampshire/Northeast Utilities, and Timberland.

The Gulf of Maine Council on the Marine Environment is an international body convened to foster cross-border cooperation among government, academic, and private groups in developing and implementing a sustainable management strategy for the Gulf, which extends from Nantucket, Massachusetts, to Cape Sable, Nova Scotia.

For information call Tony Brooks, Development Officer, at (617) 728-0542 or E-mail him at tbrooks@world.std.com.

EAC seeks collaborators for new marine species catalog

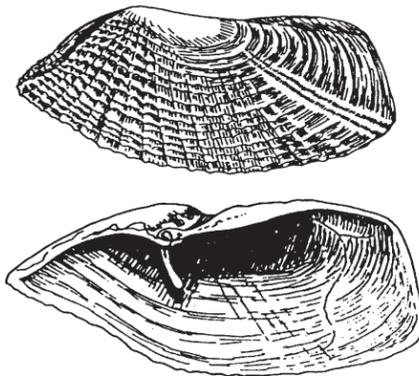
Halifax, Nova Scotia — A proposal to publish a new catalog of coastal and offshore marine invertebrate species in Canada's maritime provinces, the Gulf of Maine, and Newfoundland would provide updated, comprehensive information for planners, scientists, and educators for the first time in nearly a century.

In 1901, zoologist J.F. Whiteaves published the *Catalogue of Marine Invertebrata of Eastern Canada*, which includes a listing of more than 1,000 species. The Ecology Action Center (EAC), a non-profit environmental education group based in Halifax, hopes to publish an update of the catalog in print and electronic formats in 2001, according to Derek Davis of EAC's Marine Issues Committee. The committee is seeking interested groups to participate in the project, said Davis.

The update would include 2,000 to 3,000 species and cover a larger geographic area than the 1901 catalog. Published once with only a short run reprinted in the 1970s, Whiteaves' catalog has become hard to obtain. Though more

specific catalogs have been published in subsequent years, there is no comprehensive catalog more recent than Whiteaves', Davis said.

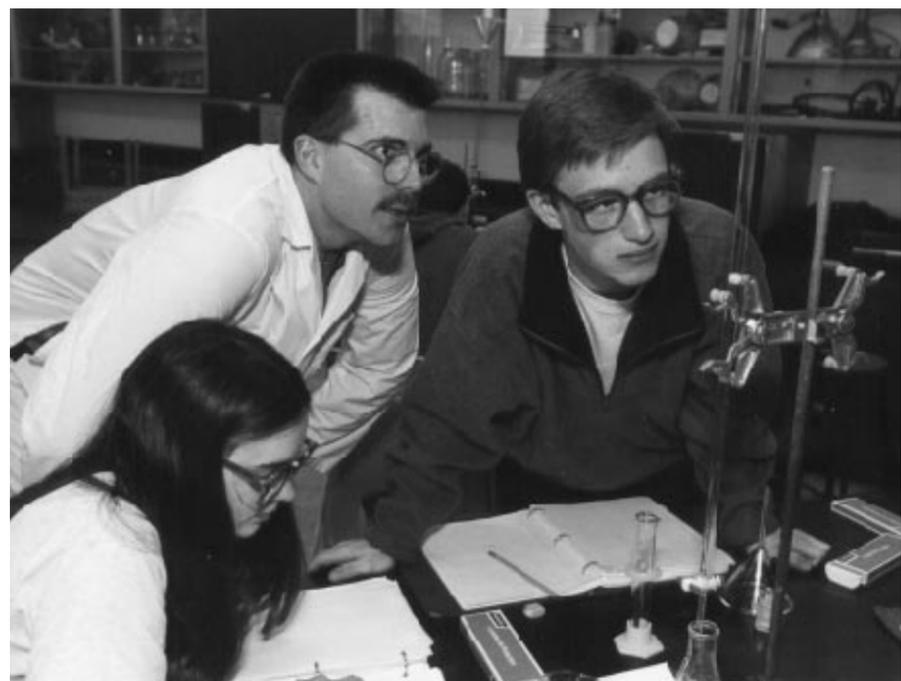
For more information, contact Derek Davis via e-mail eac_hfx@istar.ca or phone (902) 429-2202.



A proposed updated catalog of marine species in eastern Canada and the Gulf of Maine would include illustrations, such as this one of a mollusk, *barnea truncata*.

Illustration: Nova Scotia Museum

Oceans 11 lets NS students plunge into marine science



Eleventh-grade students in teacher Kevin Veinot's (second from left) class at Central Kings Rural High School in Cambridge Station Nova Scotia learn to test water quality as part of the Oceans 11 unit on aquaculture.

Halifax, Nova Scotia — "Why do I have to know this?" is a question high school students ponder with some regularity, even if they don't always ask it aloud. Oceans 11, a new curriculum that will be available in Nova Scotia this fall, will help make science meaningful to eleventh graders, say developers of the project.

The idea for Oceans 11 emerged from a workshop that included teachers and staff from Canada's Department of Fisheries and Oceans (DFO). The project has since drawn in numerous other partners, including universities, museums, private industry, and provincial and federal government departments, according to Tim Hall of DFO's Oceans Act Coordination Office.

Oceans 11 will replace eleventh-grade oceanography as an elective science class in Nova Scotia schools choosing to offer it. The curriculum combines two compulsory elements or modules — physical oceanography and marine biology — with a choice of five elective elements developed by teachers: aquaculture, coastal zone management, fisheries resources, ocean industries, and coastal navigation. Teachers can choose the elec-

tive element most relevant to their class.

Hall said the program emphasizes an "ecosystem approach," and looks to explain, rather than settle issues. Regarding use of fishing gear, for example, he said "there are so many different perspectives on it we didn't want to go in and say, 'this is the right answer.'"

Kevin Veinot, a science teacher at Central Kings Rural High School in Cambridge Station, wrote the aquaculture module of the curriculum, and taught it last school year as part of a pilot program. "We're actually applying science to something that is very common to the students," and that gets their attention, he said, adding, "We've designed it so that there's a lot of hands on activities."

Oceans 11 "enables schools and teachers to meet the diverse needs and interests of a broad range of students," according to Brian Cochrane, a science consultant at Nova Scotia's Department of Education and Culture. "When Digby students examine issues of resource management they may do so in the context of the scallop fishery. Other areas of the province will want to adapt the context to the local community and resources, such as clam harvesting in the Bay of Fundy," he said.

Resources

IYO web sites

Information on International Year of the Ocean events, activities, and more is available on these organizations' web sites:

NOAA www.yoto98.noaa.gov

UNESCO www.ocean98.org/ or

<http://ioc.unesco.org/iyo>

ME State Planning Office www.state.me.us/spo/mcp/ocean/front.htm

NH Coastal Program www.state.nh.coastal/news.htm#yoto

MA Coastal Zone Management Office www.magnet.state.ma.us/czm/

Environmental News Network www.yoto.com

NS Adopt-a-Stream manual

This community-based volunteer program takes a watershed approach to aquatic habitat restoration and fish population enhancement. Available to Nova Scotia groups on a long-term loan basis, and to others for a fee, the manual provides information on aquatic habitats and wildlife, laws and regulations, how to start and run a project, fundraising tips, and more. In Nova Scotia, contact the NS Salmon Association/Adopt-A-Stream Program, (902) 644-1276. Outside the province, contact the NS Department of Fisheries at (902) 485-5056.

National Environmental Directory

The National Environmental Directory Project is series of nine regional databases that provides descriptions and contact information for more than 12,000 US organizations involved in environmental education, management and policy. The information has been made available on the web, on diskette, and in print by the Global Action and Information Network (GAIN). Visit their web site, <http://eelink.umich.edu/GAIN/ALL.dir/orderinfo.html> or call 406-721-0440.

GOMC Five-Year Action Plan

Copies of the Gulf of Maine Council on the Marine Environment's five-year action plan for the period from 1996-2001, containing the Council's five priority goals, is available while supplies last. Call Margot Mays at the GOMC Secretariat (617) 727-9530 ext. 406, or e-mail margot.mays@state.ma.us for a copy.

The *Gulf of Maine Times*
is on the Gulf of Maine Council's Website!
<http://gulfofmaine.org>

GULF OF MAINE FACTS

- The water surface of the Gulf of Maine measures 79,000 square kilometers/ 33,054 square miles.
- The total land area of the Gulf of Maine watershed is 69,115 square miles/165,185 square kilometers.

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Gulf of Maine Council on the Marine Environment

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