



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

Visionaries in the Gulf of Maine

By Susan Llewelyn Leach

For years as a young lad Roger Berle would heed his mother’s request to take out the trash. On Cliff Island that meant dragging the bag from under the kitchen sink and trotting down to the shoreline to toss it in the ocean.

It’s a story he tells with wry irony. As one of the most energetic and effective proponents of conservation in Maine’s Casco Bay, Berle said he’s been making up for that trash misadventure ever since.

Roger Berle won the 2007 Gulf of Maine Council Longard Award for his work protecting Cliff Island, Maine.

In the intervening years, his focus has been as much about preserving island life as it has the natural habitat that makes that life so appealing.

That has meant helping bolster Maine’s island populations, which have dwindled over the decades from a high of 300 year-round island communities 150 years ago to 15 today. Of those, Berle said, 60 per cent are struggling to maintain their head count. Cliff Island, where he was raised, is



Kayakers at Musquash Paddle 2006 in the Musquash Estuary, which recently became Canada’s first Marine Protected Area thanks in part to grassroots groups like the Friends of Musquash, winner of a Gulf of Maine Council 2007 Visionary Award. **Story Pages 6 & 7**

COURTESY: DAVID THOMPSON, CONSERVATION COUNCIL OF NEW BRUNSWICK

among them.

Soaring house prices, shrinking schools and the lure of city jobs work against a revival. But Berle sees it as a test of commitment to quality of life and values.

“If we all move to cities and we’re satisfied with a strip of grass along the sidewalk, then that’s fine... [but since] water is an

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An osprey protects its chicks. **Stories Pages 3,9**

PHOTO: IAIN MACLEOD

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Ambassador for his species: If a whale could speak

By Cathy Coletti

“Do you know you hit a whale?!” shouted my mother from the side of the Atlantic Queen about 20 miles (32 kilometers) offshore in the Gulf of Maine. The upswell of anger ran through this group of about 60 whale watchers like electricity.

It was one of those days you hope will never happen again. Too many circumstances had come together, too many things that are unknowable and unplannable. The seas were calm. The sun was out. Visibility was perfect. The cool ocean air smelled of salt. My mother was meeting my little sister from Big Brothers Big Sisters after about a year of trying to get a mutually agreeable date. The three of us were out on Jeffrey’s Ledge in the Gulf of Maine in mid July, seeing whale after whale.

I had been afraid that we might be disappointed and not see anything. At first



Fin whale injured by a sport boat strike.

COURTESY: BLUE OCEAN SOCIETY

my little sister, 10, and I kept imagining that we saw whales, “What’s that?” “Over there!” but it would turn out to be just the way the sun hit the water or a buoy. Then she pointed to the front of the boat and yelled, “WHALE!” People rushed forward to see as the boat came to a stop.

From above, our naturalist, Jen Kennedy from the Blue Ocean Society for Marine Conservation, a New Hampshire-

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Invasive species...



... coming to a pier near you? **Story Page 12**

PHOTO: PETER HANLON



Who’s there? Owls on cell phones. **Story Page 5**

Ocean Tracking Network to shed light on undersea life

By Stephen Leahy

Imagine a spotlight on the ocean floor just off of Halifax, Nova Scotia, powerful enough to create a tube of light 400 metres or 1,312 feet in diameter and 20 kilometres or 12 miles out to the edge of the Scotian shelf. And imagine what this tube of light might reveal operating continuously.

While no such spotlight exists yet, there soon will be something akin to it. A series of up to 212 acoustic receivers, one every 732 metres (800 yards) or so on the ocean floor, soon will create an “acoustic curtain” 180 kilometres (112 miles) off-shore of Halifax to the edge of the continental shelf that will detect fish, seals, whales and other marine animals tagged with tiny ultrasonic transmitters.



An acoustic unit being deployed in a test. Each unit has a yellow flotation device, white acoustic modem and black acoustic receiver.

COURTESY: PACIFIC OCEAN SHELF TRACKING PROJECT

“We’ll be able to detect exactly when Atlantic salmon from the Gulf of Maine pass by on their way to Newfoundland and Labrador,” said Ron O’Dor, a researcher at Dalhousie University in Halifax. Sensors also will detect temperature, salinity, pressure and current speeds, offering new insight into when animals move and under what conditions. This could fundamentally alter the management of fisheries. “Marine scientists have never had continuous streams of data from the ocean floor before,” he said.

O’Dor is the prime mover of the ambitious C\$200 million (US\$173 million) Canadian-led Ocean Tracking Network (OTN). Canadian government research agencies, including the Canada Foundation for Innovation, committed C\$45 million (US\$39 million) to the project in part because much of the technology is

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Letters to the Editor

The **Gulf of Maine Times** welcomes readers' letters. However, we reserve the right to edit them for length and clarity. Please include your name, address and phone number. All submissions may be emailed, faxed, or mailed to the **Gulf of Maine Times**, c/o Editor. We will consider all letters for publication, but cannot guarantee that we will print and/or respond to every one.

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Editor's Notes

Visionaries An eye toward the future

As a boy, Roger Berle would obey his mother's request to take out the trash, which at that time meant dragging the bag from under the kitchen sink and tossing it into the ocean near their home on Cliff Island off of Portland, Maine. Berle cringes at that memory now. The 2007 recipient of the Gulf of Maine Council's Longard Award, Berle was honored for his commitment to protect and maintain open land on Cliff Island for recreation, educational opportunities and resource protection.

Ten other visionaries, two from each of the five states and provinces in the Gulf of Maine watershed, won Council awards as well. Each brings a spirit of energy, commitment and creativity to protect the marine environment in the Gulf of Maine. Many are grassroots and volunteer efforts by individuals or groups. In this issue of the *Gulf of Maine Times*, writer Susan Llewelyn Leach tells the stories behind their accomplishments. As Berle says, when it comes to conservation, the bottom line is



Mabel Fitz-Randolph and daughter Marie are visionaries who advocated for the Musquash Estuary, Canada's first Marine Protected Area.

PHOTO: LORI VALIGRA

that you're either going forward or moving back. There's no standing still.

Other stories in this issue include an update on an invasive species census, using cell phone technology to monitor owls, and dam removal to restore fish runs.

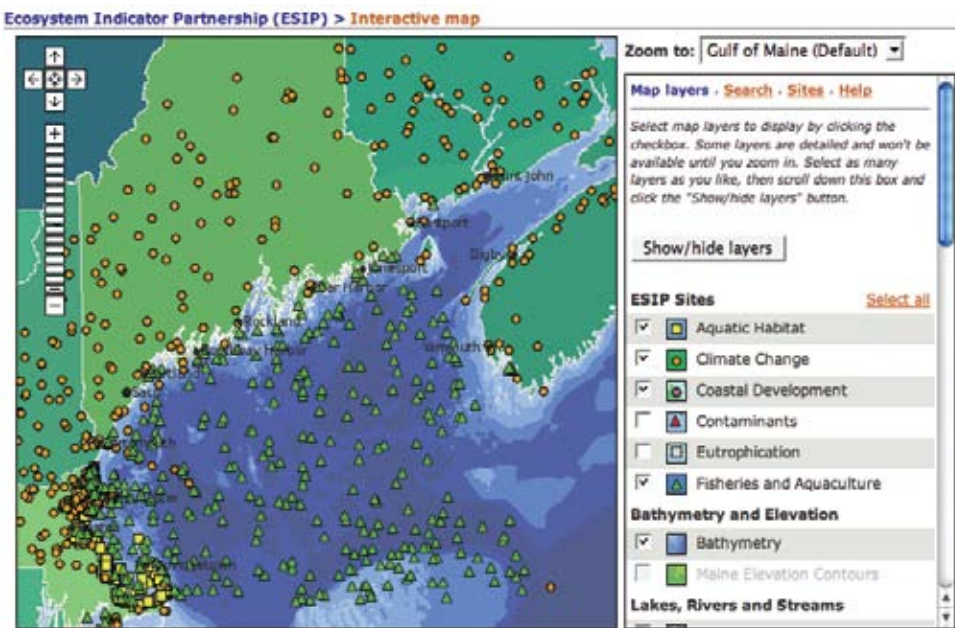
Through these stories we can see our good fortune that the Gulf of Maine attracts a lot of people with big and small visions for the future of our environment.

Lori Valigra

New version of ESIP monitoring map available

The Ecosystem Indicator Partnership (ESIP) of the Gulf of Maine Council has unveiled a new version of the ESIP Monitoring Map. The Monitoring Map is an interactive tool to consolidate information on monitoring in the Gulf of Maine. With as many as 300 programs now in place in the Western Atlantic and the Gulf of Maine, ESIP is working toward the coordination and harmonization of monitoring programs in the Gulf of Maine. The majority of the programs are marine and coastal, though some are terrestrial ones.

The ESIP long-term focus is on data synthesis and reporting focused on six areas: aquatic habitat, climate change, coastal development, contaminants, eutrophication and fisheries/aquaculture. But the initial steps in the interest of cross-program coordination have led to the development of an integrated system for identifying monitoring locations.



ESIP's new version of the monitoring map allows users to zoom to specific locations or filter monitoring programs by indicator or organization. Site information includes specific location and maps, along with information on neighboring sites.

If further detail is needed, users can follow a Web link to the parent organization. Users can also opt to download data

or make PDFs of their specific searches. The new monitoring map and revised user guide can be accessed on the ESIP Web page at: <http://www.gulfofmaine.org/esip/>.

For more information on ESIP's activities or to add programs to the interactive map, please contact Christine Tilburg at ctilburg@securespeed.us.

Letter to the Editor

Dear Editor,

I read with great interest your article, "Toxins in Casco Bay," which appeared in the summer issue of the Gulf of Maine Times. I wanted to add that Friends of Casco Bay has also been running periodic tests of stormwater entering the bay and results have shown detectable levels of multiple herbicides and at least one insecticide and fungicide — chemicals used by homeowners and commercial applicators for lawn and yard care. Some of the concentrations found in these samples have exceeded aquatic life criteria and may be adversely impacting aquatic invertebrates and fish species.

With these test results in mind and the fact that distribution and use of lawn and garden pesticides has increased dramatically in Maine in recent years (more than three million pounds in 2004, mostly

weed and feed products for lawns), Friends of Casco Bay and the Maine Board of Pesticides Control created first the BayScaper program for Casco Bay and then the state-wide initiative, YardScaping (<http://www.yardscaping.org>). These are essentially public education/outreach programs with the message that beautiful lawns, gardens and landscapes can be created through ecologically based practices which minimize reliance on water, fertilizer and pesticides.

The centerpiece of our current YardScaping efforts is the Back Cove YardScaping Demonstration Project — the Back Cove being an integral part of Casco Bay. The city of Portland, one of the 30 or so YardScaping partners, donated about three acres (1.2 hectares) of land along the cove to develop a site that will demonstrate the basic YardScaping principles for both the general public and professionals. It's also likely that the site will be the base for a

training program for landscapers and others developing landscapes. The first phase of the project is almost complete: The Maine Conservation Corps, City of Portland Parks & Recreation Department and Maine Master Gardeners have constructed two-thirds of the 1,000-foot-long, seven-foot-wide (305-meter long, two-meter-wide) walking path that will wind through the gardens. The path is linked at both ends and through two spurs to the existing Back Cove Trail, which is very popular with hikers and bikers. The project Web site is: <http://www.yardscaping.org/demo/portland.htm>.

Thank you for your interest!

Paul Schlein
Public Information Officer
Maine Board of Pesticides Control
Augusta, Maine
<http://www.thinkfirstspraylast.org>

Gulf Voices

A day on Great Bay: In search of the osprey

By Karen Finogle

It could be a signal for Batman, but it's day not night, and we're not in Gotham. Still, the form spiraling overhead has the right symmetry. The small head tucked between two boomerang wings set against a deep blue sky. The sleek, geometric angles you could set a ruler against. With a wingspan of five feet or more, it quickly dips down from the sky and crosses the water not far from my kayak. I let the boat dance in the slow current as I train my binoculars on the bird. It hovers over a wooden post, like a plane turned stealth helicopter, twitching its body and swooshing its wings in rapid fire before landing.

Such a sighting was once rare in Great Bay, an estuary in southeastern New Hampshire. The osprey was nearly wiped out in the 1950s and 1960s from DDT poisoning in fish, the only food the raptors eat. There were less fish too. Water pollution from sewage and industrialization dating back to colonial times had soiled the nine square miles (23 square kilometers) of the bay.

Now, at least a dozen pairs of ospreys return to Great Bay each spring to hunt and raise a family. It's still a state-listed threatened species, but the osprey has taken roost, and together we share water and habitat now more pristine than any other estuary along the East Coast.

New Hampshire's 18-mile (29-kilometer) coastline is the shortest in the United States, a mere afterthought as you head from Massachusetts to Maine. But include the land that stretches back 10 miles (16 kilometers) up the Piscataqua River and outlines Great Bay, and you have about 150 miles (241 kilometers) of tidal shoreline that frames one of the largest estuaries on the Atlantic Coast — an ecological jewel that's home to 162 bird, fish and plant species and set in one of the fastest growing areas of the state.

I cap the binoculars and pick up the paddle to push forward. My oars cut easily through the placid water; the rumble of motorcycles, SUVs and cars on the road near our put-in becomes muffled, then disappears. Framed by five towns, Great Bay is a refuge from the normal hum of life. Ahead, my partner Pete disrupts a gaggle of cormorants and gulls gossiping and preening on the salt marsh banks, the only crowds we'll encounter today.

We had plunked our kayaks in at the Squamscott River to paddle up the western shoreline of Great Bay proper. There's little wind, and it's easy to forget 98 percent of the water is saline, that the tides are always pulling and pushing against this flooded depression, sunken by the weight of glaciers thousands of years ago and then drowned in ice-water engorged ocean. There is no crash of waves on the shore, no sandy beaches. Meadows and woodland runs into salt marsh that dance in the shallows, disturbed by only a smattering of houses here and there.

The western shore is a quintessential New England pastoral, one that you would expect to unfold on a secluded lake. Then the oar flicks water on my face, and I lick my lips. The saltiness is unmistakable. The pull of the kayak forward, towards the sea, is celestial.

Pete and I live on the Oyster River, another tributary that flows into Little Bay, just north of Great Bay proper. I saw my first osprey from our dock. Heard the staccato-high "chirp, chirp, chirp" of one as it called to its mate. Waited so patiently, neck craned back, to see one bullet-dive for a fish and then beat its giant wings to shed the weight of water and gravity once more.



Osprey with chicks. The mother (right) has the dark chest and the smaller male has the white chest, coloration that is typical of ospreys. Females usually have a dark necklace that sometimes is very dark and extensive like this bird pictured. Each chest pattern is different and is an aid in identifying individuals. Males are usually much whiter on the chest and head.

PHOTO: IAIN MACLEOD

I admired the freedom of their air current surfing, their sense of ownership and singularity of purpose — their wildness in an area that was tamed centuries ago. I have since haunted the bay in my boat from our dock and other put-ins. Always in search of their company, my eyes have become tuned to their aerial frequency.

Fingers tingle from the figure eight up-down, up-down of the two-hour, six-mile (9.6 kilometer) paddle to Adam's Point. This spigot of land marks the northern terminus of Great Bay proper and is



Karen Finogle paddling on Great Bay.

PHOTO: PETER INGRAHAM

a place we frequently paddle and drive to in order to walk the trails that weave along cliffs and into meadows gone wild. I pull my kayak up onto the rocky shoreline where water funnels quickly through Furber Strait. Mud flats give way to wide rocks for seating. With cheese, bread and hummus pulled from my boat's hull, Pete and I settle on a slab warmed by the sun to scan the skies above the 1,082-acre (138-hectare) Great Bay National Wildlife Refuge on the opposite shore.

We've finished lunch before we see them. First one, then two figures dot the sky above the refuge. Sailing on currents of air, they scan the waters below, waiting for the afternoon sun to puncture the surface and reveal the scales of elusive fish. I wait for the telltale signs — the sleek wings that angle down into a pencil point. The flap-flap-glide of the wing beat that distinguishes them from just another gull on steroids. Two ospreys, their black stripe over their eyes similar to a superhero's mask, have arrived. The tide is shifting and it's nearly time for us to launch, but I wait. I watch and wait until they shift course and drop back down behind the tall pines in the refuge. The water tugs at the stern of my boat, in an arm wrestle with the mud at the bow. We put in to chase the current back.

Karen Finogle, a free-lance writer and senior editor at AMC Outdoors, lives in Durham, New Hampshire.

New Brunswick, Nova Scotia to jointly study Fundy tides

New Brunswick and Nova Scotia are collaborating to study tidal energy in the Bay of Fundy. The two provinces will work to complete Strategic Environmental Assessments (SEA) of the Bay of Fundy before developing tidal energy policies.

The SEA will consist of two main parts: an Environmental and Socio-economic Impact Assessment Report and extensive stakeholder feedback and consultation.

The assessment will provide a better indication of where potential tidal energy sites could be located and any opportunities and constraints that may exist.

"This is an important step forward in developing future tidal projects which could benefit both of our provinces," New Brunswick Energy Minister Jack Keir said in a statement.

Last year, both New Brunswick and Nova Scotia participated in a tidal energy study conducted by the Electric Power Research Institute, which provided analysis and identified approximate megawatt potential for each province. The new study will go into greater detail on site-specific issues.

For more information see: <http://www.offshoreenergyresearch.ca/Home/tabid/77/Default.aspx>.

MIT builds robotic fin for submersible vehicles

Inspired by the efficient swimming motion of the bluegill sunfish, researchers at the Massachusetts Institute of Technology (MIT) are building a mechanical fin that could one day propel robotic submersibles or autonomous underwater vehicles (AUVs). Those vehicles perform functions from mapping the ocean floor to surveying shipwrecks.

The MIT team hopes to create a more maneuverable, propeller-less underwater robot better suited to tasks such as sweeping mines and inspecting harbors by mimicking the action of the bluegill sunfish.

"If we could produce AUVs that can hover and turn and store energy and do all the things a fish does, they'll be much better than the remotely operated vehicles we have now," James Tangorra, an MIT postdoctoral associate working on the project, said in a statement.

The researchers chose to copy the bluegill sunfish because its distinctive swimming motion results in a constant forward thrust with no backward drag. In contrast, a human performing the breaststroke experiences drag during the recovery phase of the stroke.



MIT's robotic fin.

PHOTO: DONNA COVENEY

Tangorra and his colleagues at MIT have broken down the fin movement of the bluegill sunfish into 19 components and analyzed which ones are critical to achieving the fish's powerful forward thrust.

"We don't want to replicate exactly what nature does," said Tangorra. "We want to figure out what parts are important for propulsion and copy those." So far, the team has built several prototypes that successfully mimic the sunfish fin. They reported the successful testing of their most recent fin, which is made of a cutting-edge thin, flexible material that conducts electricity, in the June issue of the *Bioinspiration & Biomimetics* journal. The fin can replicate two motions the researchers identified as critical to the propulsion of the sunfish fin: the forward sweep of the fins and the simultaneous cupping of the upper and lower edges of the fin.

When an electric current is run across the base of the experimental fin, it sweeps forward, just like a sunfish fin. By changing the direction of the electric current, the researchers can make the fin curl forward at the upper and lower edges. But it has been a challenge to make the fin sweep and curl at the same time. Placing Mylar polyester film strips along the fins to restrict their movement to the desired direction has proven successful. The team continues to seek alternatives. For more information visit: <http://web.mit.edu/newsoffice/2007/robot-fin-0730.html>.

SCIENCE INSIGHTS

A standard approach to monitoring dam removal

By Peter H. Taylor

Almost every day, when I am driving around the Maine town where I live, I cross a bridge over the Royal River. It is a scenic river about 150 feet (46 meters) wide that drains an area of 365 square kilometers (141 square miles) into Casco Bay. For more than a century, the river was the town's lifeblood. Dams powered mills that provided jobs for hundreds of people.

Today, the Royal River has lost its prominence in the local economy. The mills are mostly gone, and the town has become a quiet, residential suburb. Now people mainly value the river as a scenic feature and a place for recreation. It no longer provides many jobs. But the dams are still here, impeding the flow of water from uplands to the sea.

When I am driving across the river, I usually glance downstream at one of the dams. I muse about the fish that cannot migrate because of it and the other lost connections between land and sea. These dams are such longstanding elements of the local scene, and seem so integral to the place, that it is easy to forget they were not always here. Except for the last few hundred years — a blip in geological time — the Royal River flowed free. How would the ecosystem respond if its dams were removed?

Covering 179,000 square kilometers (69,000 square miles), the Gulf of Maine's watershed encompasses the entire state of Maine and parts of New Hampshire, Massachusetts, Nova Scotia, New Brunswick and Quebec. The Royal River is one of many rivers that drain water from this land area into the Gulf. It has two dams, according to the Inventory of Potential Habitat Restoration Sites (<http://restoration.gulfofmaine.org/nea/search.php>).

The number of dams on these rivers is astounding. Rivers in the U.S. portion alone of the Gulf of Maine's watershed have more than 4,800 dams. State inventories found 2,506 dams in New Hampshire, 782 in Maine and 1,579 in Massachusetts. (Inventories varied in comprehensiveness, and Maine undoubtedly has many more than 782 dams.) Many of these dams are aging and are no longer needed, but they

continue standing as relics.

While the Royal River is no longer the economic lifeblood of my town, it continues to be — just as it always has been — a critical part of the ecosystem. The freshwater ecosystem of the river itself connects intimately in innumerable ways with the surrounding terrestrial ecosystem and the marine ecosystem into which it flows. Like plaques clogging an artery, the dams on the Royal River impair the health of the river and, in turn, the larger ecosystem.

Recognizing that removing dams can benefit the ecosystem, the economy and public safety, government agencies, non-government organizations and private parties have demolished some 600 dams throughout the United States in recent decades. Some 20 dams have been taken down in the U.S. portion of the Gulf of Maine's watershed since 1995, and 20 more are being considered for removal.

These projects require tremendous investments in time and money, and sometimes they are contentious because of the socioeconomic significance of dam removal. It makes sense that ecological changes should be monitored afterwards to determine if the goals were accomplished and to learn the best ways to conduct dam removals. For most dam removals, however, little information is collected about the riverbed, wildlife and habitats. When monitoring does occur, the methods vary tremendously, making it difficult to compare outcomes of different dam removals. We know far less than we should about how the ecosystem responds after a dam is removed.

The online Inventory of Potential Habitat Restoration Sites provides information, photos and maps of dams and other human impacts on the Royal River and three other rivers that flow into the Gulf of Maine. It can be searched at: <http://restoration.gulfofmaine.org/nea/search.php/>. Or, explore the sites on an interactive map at: <http://www.gulfofmaine.org/maps/hrp/htdocs/index.html?map=nea>.

An initiative led by the River Restoration Monitoring Steering Committee of the Gulf of Maine Council on the Marine



The Sparhawk Mill dam on the Royal River in Yarmouth, Maine, is a cement dam with a fish ladder. No water goes over the dam, and there is an eight-foot (2.4-meter) drop to rock ledge. Sediment has accumulated behind the dam. According to an inventory in 2005 commissioned by the state of Maine, the mill owner was still using the dam to generate power. At the time of the survey, debris had accumulated at the top entrance to the fish ladder, possibly interfering with passage of diadromous (sea-run) fish.

PHOTO: PETER TAYLOR

Environment is addressing this knowledge gap. Working with more than 70 scientists, resource managers and watershed restoration practitioners from around the Gulf of Maine, the Steering Committee has developed a standardized approach to environmental monitoring of dam removal sites. According to a document produced by the Steering Committee with assistance from the New Hampshire Coastal Program, if this approach is adopted scientists should be able to:

- evaluate the performance of individual habitat restoration projects;
- assess the long-term ecological response of regional restoration efforts;
- advance our understanding of restoration ecology and improve restoration techniques;
- better anticipate the effects of future stream barrier removal

projects; and

- communicate monitoring results to stakeholders and the public.

In this standardized approach, the Steering Committee has identified eight critical monitoring parameters for every dam removal site: monumented cross sections, longitudinal stream profiles, stream bed sediment grain size distribution, photo stations, water quality, riparian plant community structure, macroinvertebrates and fish passage assessment. A forthcoming guide produced by the Steering Committee in collaboration with the Gulf of Maine Science Translation Project and the New Hampshire Coastal Program will present the rationale and methods for using these parameters. Release of the monitoring guide will be announced on the Gulf of Maine Council's Web site (<http://www.gulfofmaine.org>).

Perhaps one day, as I drive across the Royal River, I will glance downstream at where a dam used to be and see a group of scientists wading in the water, using these standardized monitoring methods. Then I can find out how the ecosystem responds to the river flowing free again.

Peter H. Taylor (<http://www.waterviewconsulting.com>) is a consultant for the Gulf of Maine Science Translation Project.

Sappi Paper to remove dam on Presumpscot River

Sappi Fine Paper North America reached a preliminary settlement in July that will enhance fishery restoration efforts on the Presumpscot River, which runs 25 miles (40 kilometers) from Sebago Lake to its mouth at Casco Bay in southern Maine. The agreement is among Sappi and American Rivers Inc., the Friends of the Presumpscot River, the Maine Department of Marine Resources and the U.S. Fish and Wildlife Service. A final settlement is expected by year end.

The preliminary agreement includes removing all components of the Cumberland Mills Dam, installing fish lifts at Saccarappa Dam and initiating a trap and

truck program to jump-start the restoration of native sea-run species throughout the upper watershed. The actions are expected to trigger fish passage at Mallison Falls, Little Falls and Gambo dams.

The settlement stipulates that all work on the removal of the Cumberland Mills Dam and all renovations to the area will be completed and operational by May 2011. Additional work will include fish lifts at Saccarappa Dam, and at the upriver dams, as fish return to the river.

"Once a final settlement agreement is executed, we will have taken a huge step forward in restoring native fish species to our river. These species link our rivers and

the ocean, and rebuild both ecosystems," Dusti Faucher, president of Friends of the Presumpscot River, said in a statement.

Added Marvin E. Moriarty, Northeast regional director for the U.S. Fish and Wildlife Service, "With the proposed settlement agreement, we can look forward to a future of fish restoration in this watershed, where we have not seen natural fish passage for more than 250 years."

Currently Sappi provides minimum flows for fisheries at four Sappi dams: Eel Weir, Dundee, Gambo and Mallison Falls. These minimum flows are provided to improve the fisheries for trout and other species on the Presumpscot River.

For more information visit:

<http://www.sappi.com/SappiWeb/News/News+in+North+America/Preliminary+Agreement+Reached+on+Presumpscot+River+Fishways.htm> and <http://www.presumpscotriver.org/Text/RiverFacts.html>

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Profile of Dale Joachim, MIT Media Lab

Nothing to hoot at: Owls may sense changes in the environment

By Lori Valigra

Dale Joachim became intrigued when he heard that some birds left New Orleans before Hurricane Katrina hit in late August 2005. Were the birds able to sense the impending storm?

“The vocal behavior of birds may provide information about abrupt changes in the environment, as can a flock of birds moving,” said Joachim, a visiting professor at the Massachusetts Institute of Technology’s Media Lab. Joachim is cooperating with Maine Audubon and others to study bird vocalizations as part of the Media Lab’s Owl Project.

He could have used such a warning system himself. The former assistant professor of computer architecture at Tulane University in New Orleans was on a cruise in the Gulf of Mexico before Katrina hit New Orleans. He got home just in time to evacuate his family.



Dale Joachim, visiting professor at the MIT Media Lab, is broadcasting and recording owl sounds through networks of cell phones to help in census and other information.

COURTESY: JONATHAN WILLIAMS/MIT MEDIA LAB

Now at the Media Lab, Joachim has developed an experimental electronic sensing device that can broadcast and record owl vocalizations through cell phone networks. One goal is to help count the number of owls, a task traditionally done by humans. That’s a tough job in the vast wooded expanses in Connecticut and Maine, where his studies are focused. The device also can monitor climate, and may eventually answer questions about the hearing range of owls and their responses to weather or the presence of humans. The device and cell phone networks could be used for other species of animals as well.

As a child, Joachim had traveled the world with his teacher parents. At one time he lived in Africa, where he felt a strong bond to nature and animals. But years working at universities and in industry as an engineer severed his link to animals.

“After Katrina, I wanted to focus on something that contributes to a larger picture,” he said. “As humans, we’re losing track of our connections with nature.”

Joachim’s approach is to use technology to augment human activity. The owls he’s tracking, the Barred owl and the Eastern Screech owl, live along rural roads. The cell phones are mounted onto tripods set amidst the trees. Some cell phones have loudspeakers attached to them, while others have his triangular electronic device about the size of a human hand with four microphones.

The cell phones play pre-recorded owl calls through the loudspeakers in an effort to elicit responses from real owls. The responses from real owls are picked up by the microphones on the electronic device. Joachim uses multiple cell phones to get a sense of the direction from which the owl sounds are coming. The directional information also can separate different owl sounds. In the future, sophisticated electronic signal processing technology may make it possible to isolate a particular owl’s call.

Augmenting humans

Traditionally, volunteers and scientists go into the woods at night and play pre-recorded owl sounds on a CD or tape



Owl at sunset.

COURTESY: STOCKVAULT.NET/RAFAEL FARRIOLS

recorder. Joachim’s cell phone device can automate that process, thus augmenting human owl-monitoring activities. In the spring of 2007, volunteers in Maine Audubon’s Maine Owl Monitoring Program field tested the cell phone devices along established survey routes for their owl census. The aim was to get insight into some long-standing questions about owl survey methodology.

According to Maine Audubon, owl detections are much higher when a play-

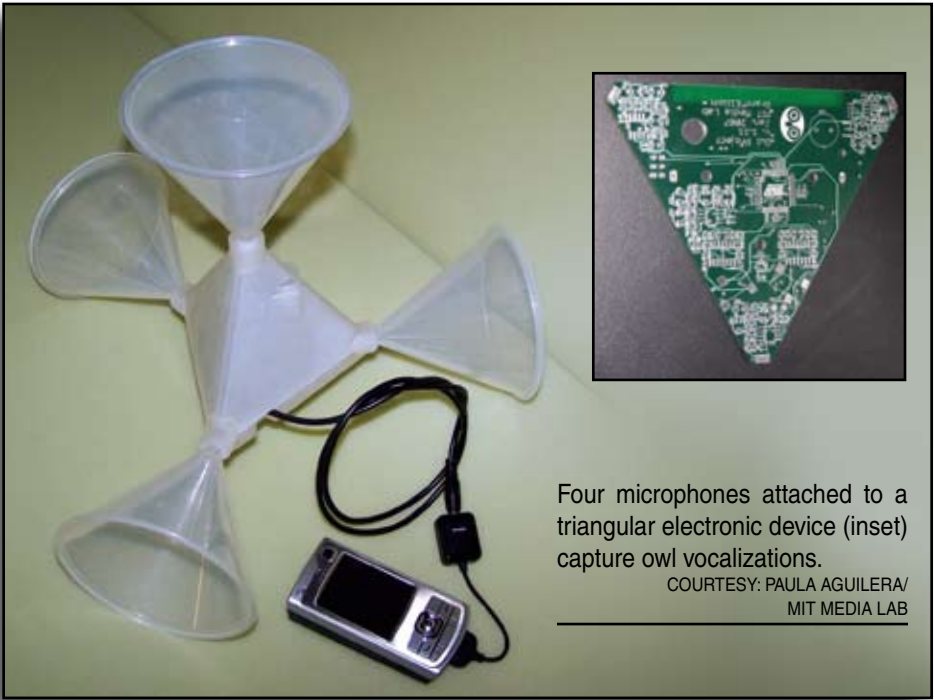
back call is used as opposed to simply having a volunteer sit passively and listen for owl calls. However, scientists are concerned that when playbacks are used at one survey point, they may impact owls further down the survey route, which usually is a rural road. The new cell phone network technology allows for simultaneous recordings to be played at multiple points along the road. That could shed some light on how owls in one area may react to sounds in other areas. Joachim can control the recording and broadcasting events via the Web using voice-over-Internet Protocol (voice-over-IP) technology.

The Maine study was more extensive than the pilot census of Connecticut’s owl population conducted in the summer of 2006. That earlier study showed that the audio quality of cell phones is sufficient for the discovery and interaction with owls. The phones, which are small and portable, could potentially replace the high-quality audio survey broadcasting and recording equipment currently used.

“This is a way to reconnect nature and people,” said Joachim. “There is a potential for education and dissemination.”

For more information visit: <http://owlproject.media.mit.edu/> and http://www.maineaudubon.org/conserv/citsci/owl_mit.shtml.

Lori Valigra is editor of the Gulf of Maine Times.



Four microphones attached to a triangular electronic device (inset) capture owl vocalizations.

COURTESY: PAULA AGUILERA/ MIT MEDIA LAB

Outside the Gulf

Water is the enemy of most glue, but scientists at **Northwestern University** in Illinois have married the sticking properties of the terrestrial gecko and the underwater mussel in a new synthetic adhesive called “**geckel**.” Geckos can scurry up vertical surfaces and move upside down thanks to a substance on their feet that acts much like a sticky note. But underwater, that ability to stick is reduced dramatically. Mussels are well known for their sticking ability underwater. Geckel works both in air and water. The scientists published their work in the July 19 issue of *Nature*. The researchers envision the substance being used to replace wound sutures and as a water-resistant adhesive for bandages. For more information see: <http://www.northwestern.edu/newscenter/stories/2007/07/messersmith.html>.

Marine Protected Areas (MPAs)



A gecko clings to a mussel.

COURTESY: NORTHWESTERN UNIVERSITY

are often hailed as a way to halt serious declines in marine species that have been overfished, but their effectiveness as a fisheries management tool remains unclear. Simon Thorrold, a fish ecologist from the **Woods Hole Oceanographic**

Institution in Massachusetts, has come up with a novel technique for tagging fish that could test the success of MPAs. Thorrold and his colleagues plan to use harmless **chemical tags** to track the dispersal of the larvae of coral reef fish in the western Pacific Ocean. They will focus on grouper and snapper around the Great Barrier Reef and Papua New Guinea. Through a new technique known as TRAnsgenerational Isotope Labeling, or TRAIL, the researchers will introduce an artificial chemical tag into the tissues of mature female fish just before spawning. That chemical tag is passed to the female’s offspring and becomes a chemical signature within the ear bones of the next generation of fish. Researchers can then track the dispersal of the tagged larvae across reefs and large stretches of open ocean. This chemical tagging approach has been successfully tested in limited studies with clownfish and butterflyfish. For more

information see: “Tracking Fish to Save Them” <http://www.whoi.edu/oceanus/viewArticle.do?id=3805> and “Do Marine Protected Areas Really Work?” <http://www.whoi.edu/oceanus/viewArticle.do?id=3782>.



Fish ecologist Simon Thorrold, an associate at Woods Hole Oceanographic Institution, will test the efficacy of Marine Protected Areas through a novel technique for tagging fish.

PHOTO: TOM KLEINDINST, WOODS HOLE OCEANOGRAPHIC INSTITUTION

Making a difference

By Susan Llewelyn Leach

Each year, the Gulf of Maine Council gives out Visionary and Longard Awards recognizing innovation, creativity and commitment to protecting the marine environment of the Gulf of Maine. The Visionary Awards are presented to two individuals, businesses or organizations within each state and province bordering the Gulf of Maine.

One Longard Award is presented to an unpaid individual from one of the five states and provinces who is dedicated to environmental protection and sustainability of natural resources within the marine, near shore and watershed environments of the Gulf of Maine (see story on Roger Berle, Pages 1,8). The award is named in memory of Art Longard, a founding member of the Gulf of Maine Council.

Massachusetts

Susan Jones Moses

Growing up in the shadow of the six-million-acre (2.4-million-hectare) Adirondack Park in New York State, Susan Jones Moses was never far from open spaces and natural water — the type of environment she now works so hard to protect in Essex County.

When she first moved to the North Shore of Massachusetts in 1992, she said she was struck by the pace of development. In her own town of Rowley, which sits on the edge of Great Marsh, agricultural land was rapidly disappearing to new housing. Jones Moses went to work. Combining her expertise as a planning consultant with her flair for distilling complex issues into terms people could understand, she built local support for town overrides and laws that now protect more than 400 acres (162 hectares) of the marsh's watershed.

Her successes in Rowley as a volunteer crisscrossed with her planning career and led to a contract with the Essex County Forum. The county's 34 communities now look to her for zoning and land protection advice. While she sees her job as part education, part technical assistance, often the biggest challenge is getting property owners to recognize the connection between the land and marine environment, she said. "Whatever people do on their land doesn't just stay on their land," she explained. "Their actions affect the sea a mile (1.6 kilometers) away."

Her educational push also comes in the form of workshops on smart growth issues for local planning and zoning boards. She argues for open space protection to be an integral part of affordable-housing design. At the most fundamental level, she challenges people to think outside their own interests.

Essex County Greenbelt Association

Ed Becker reckons there are two decades left to make a difference. The executive director of the Essex County Greenbelt Association is referring to the nonprofit's conservation efforts. Over the years the land trust, based on the North Shore of Massachusetts, has steadily acquired parcels of land that have ecological, scenic or agricultural value. But as prices soar and development encroaches, the opportunity to protect is diminishing.

"We know that 25 percent of the land base left is available for development," Becker said. But not all of that is worth conserving. As the window closes, Greenbelt is becoming more strategic and proactive in reaching out to landowners, Becker said.

In 46 years, the association has protected more than 12,000 acres (4,856 hectares) of land and transformed 4,500 acres (1,821 hectares) of that into a reservation system open to the public. Some of those

parcels skirt Great Marsh and offer unique opportunities to bird watch, hike and canoe. Walks, talks and a guidebook are all part of the organization's educational output along with information on the natural history of all the reservations.

As its name suggests, Greenbelt is keen to create natural corridors along rivers, streams and coastlines both for the view and the environmental benefit. Past successes and a reputation for getting things done have aided that quest, Becker said. The organization is often approached by owners wishing to gift their property or create a conservation easement.

Increasingly, he said, Greenbelt is using that real estate experience to assist cities and towns in Essex County to protect more open space and compound the conservation effort.

New Hampshire Great Bay Stewards

Each day salt water comes rushing up the Piscataqua River in a 10-mile (16-kilometer) race to meet fresh water in New Hampshire's Great Bay. That mingling of sea and river in the country's most recessed estuary has created a unique ecosystem, one that the Great Bay Stewards are working to protect.

The Great Bay National Estuarine Research Reserve was established in 1989, and five years later a Discovery Center was built at Sandy Point on the bay. The Stewards came along in 1995 to support the reserve and the center, monitor the watershed and organize fund-raising and educational events for children and adults.

Each year, the Stewards offer two University of New Hampshire students \$1,000 each to do a research project on the bay. One project last year measured the nitrogen levels around the bay and thus the pollution, said Peter Flynn, the president of the Stewards.

As their name suggests, the Stewards regularly check that no building or dumping is going on in lands with conservation easements along the bay's shores. But the biggest challenge, Flynn confided, is providing funds and assistance to volunteer efforts. With the help of its 200 members, the nonprofit organizes many fund-raising events, such as 5K races and art shows. And although each event doesn't bring in large sums, he said, the public learns of the conservation efforts for the bay. And that educational outreach is just as critical. "It's amazing to me how many people who have lived here for years don't know what the Great Bay estuary is all about," Flynn said. "Many still think it's a lake."

Jen Kennedy and Dianna Schulte

If you want to capture children's attention, introduce them to a 60-foot (18-meter) inflatable fin whale. That's the approach of Jen Kennedy and Dianna Schulte, who use the home-made mammal in school presentations on the marine environment.

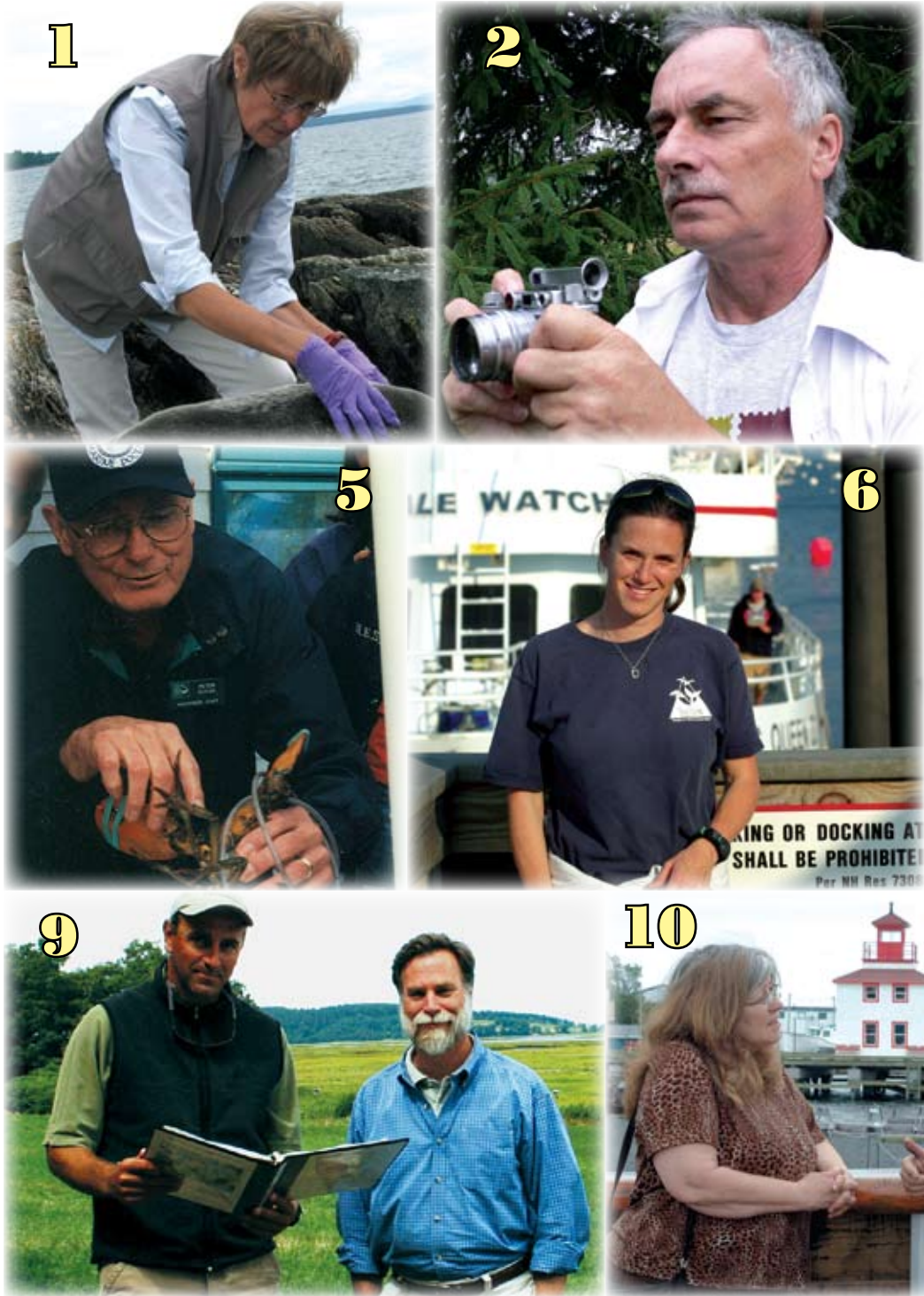
The two whale-watch naturalists and cofounders of The Blue Ocean Society for Marine Conservation work hard to engage children and the public. To that end, the Portsmouth, New Hampshire, nonprofit coordinates with four local whale watch companies and offers presentations to waiting passengers.

Since people learn in different ways, Kennedy said, the naturalists try to address all the senses — through whale sounds, reading materials, touch tanks and talks. The touch tanks, an idea Kennedy developed with the help of interns, sits dockside full of small sea creatures people can meet up close. But perhaps not too close since they include crabs, sea urchins and sea stars.

Education is only half the story. Blue Ocean collects data on marine life from the whale boats and tracks floating debris. Whale fins are photographed and a detailed

VISION

Protecting the future



1) Susan Shaw, Marine Environmental Research Institute; 2) Clifford Drysdale, Mersey Tobetic Res; 3) Peter Flynn, Great Bay Stewards; 4) Jen Kennedy, Blue Ocean Society; 5) Dianna Schulte, Blue Ocean Society; 6) Ed Becker, Essex County Greenbelt Association; 7) Ishbel Munro (left), Coastal Communities Network; 8) Alice Drysdale, Blue Ocean Society; 9) Lori Valigra, Blue Ocean Society; 10) Susan Jones Moses, Essex County Greenbelt Association; 11) Judy Noyes, Blue Ocean Society; 12) Liz Langille, Blue Ocean Society; 13) Fundy North Fishermen's Association.

record of each mammal's behavior noted and catalogued. All this data is then shared with other whale research organizations in Maine and Massachusetts and made available to the public. It even becomes the basis for science projects in schools.

Blue Ocean's research on endangered species also helps conservation efforts and is used to identify areas that need protection. Regular beach cleanups and an Adopt-a-Beach program begun in 2004 have become successes, with 25 "adoptions" so far.

Maine

Jane Disney

Jane Disney claims no credit. She said her students took her places she didn't have the courage to go. The Mount Desert Island Water Quality Coalition (MDIWQC) grew out of their initiative, the former biology teacher said. And in the space of a few years, since its inception in 2000, the coalition has lived up to its name. By drawing together children, college students, island residents, businesses and fishermen into its projects, it has built community awareness of the local watershed and fundamentally changed people's behavior.

It all started at Seal Harbor Beach. There, the students monitored water quality to identify pollution issues that threat-

ened public health. From that the coalition gathered momentum and now includes regular surveys of clam flats and the shoreline; plankton and beach monitoring; research and education at its bio lab and the Community Environmental Health Laboratory, which runs in partnership with the MDI Biological Laboratory in Salisbury Cove (Bar Harbor); and student internships and community outreach programs.

Many projects have become an integral part of the region's school science curriculum. For third graders, that means trooping out to storm drains, collecting data about the trash around them and stenciling a large stylized fish and warning sign. This alerts the public that the drains dump directly into the bay.

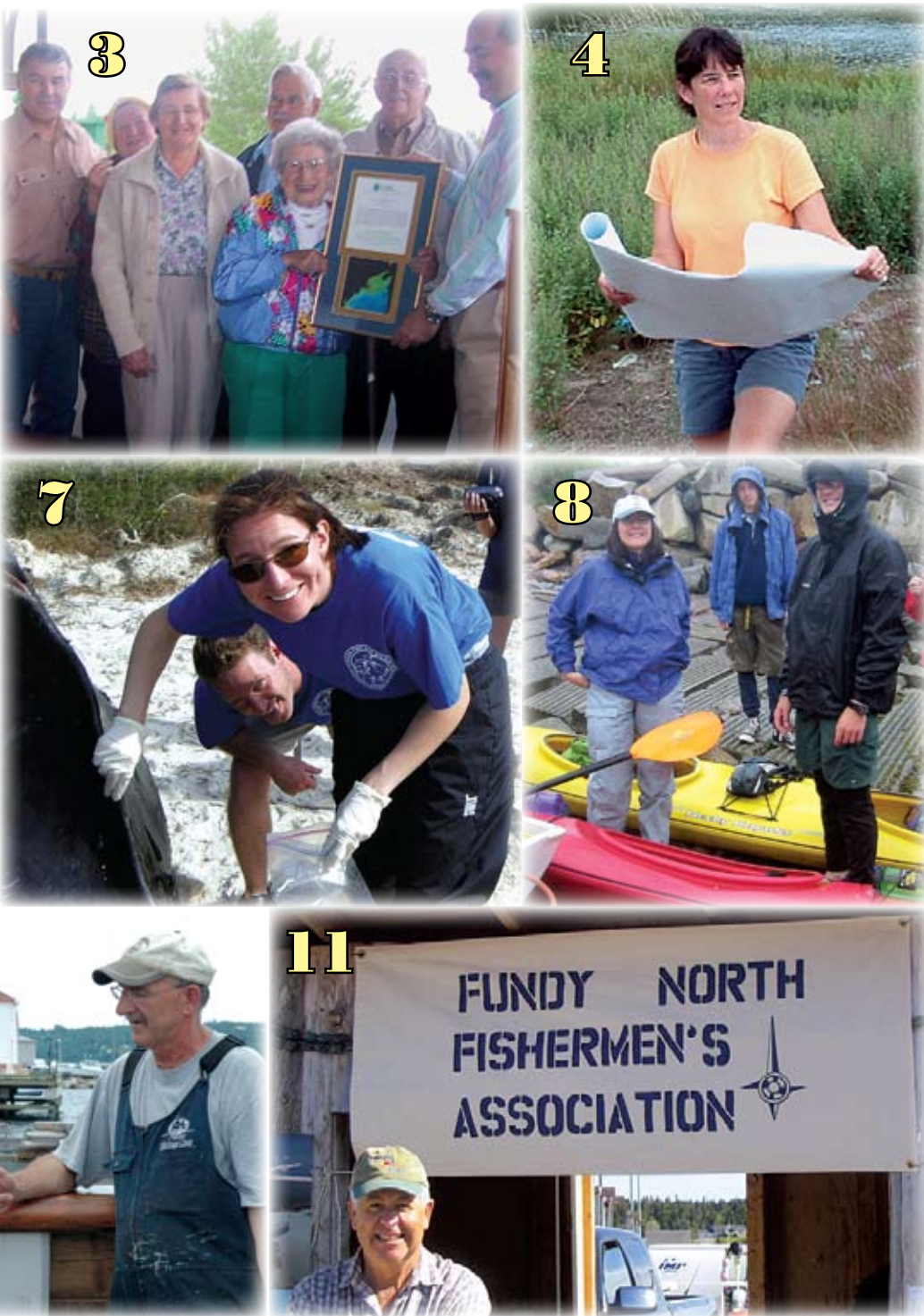
The children get "pretty worked up about runoff," said Disney, now executive director of MDIWQC. It's an example of how youthful energy can galvanize town council members into acting on their responsibility to the next generation, she said. "Kids here are leading the call to action."

Susan Shaw

The issue seems surprisingly simple. People understand when humans are at risk from toxic chemicals, but they don't recognize when marine mammals are, said

FAIRIES

e of the Gulf of Maine



Research Institute; 3) David Thompson (left) and Friends of Musquash; 4) Susan Jones Moses; 5) Peter Accardo; 6) Jane Disney (left), Mount Desert Island Water Quality Coalition; 7) Dave Rimmer (left) and Corey Accardo; 8) Rich MacDonald; 9) Essex County Greenbelt Association; 10) Greg Thompson, Fundy North Fishermen's Association. PHOTOS: 1) Marine Environmental Research Institute, 2) Peter Accardo, 3) David Thompson, 4) Susan Jones Moses, 5) Peter Accardo, 6) Jane Disney, 7) Dave Rimmer, 8) Rich MacDonald, 9) Essex County Greenbelt Association, 10) Greg Thompson.

Susan Shaw. And nor do they see the significance of the link between the two. Her institute's groundbreaking research into harbor seals is exposing that connection and changing public policy along the way.

For several years, the Seals as Sentinels project, run out of the Marine Environmental Research Institute Shaw founded in Blue Hill, Maine, has been identifying alarming levels of pollutants in the Gulf of Maine's harbor seal populations. Along with PCBs, Shaw discovered rising concentrations of flame retardants in the seals. That was a first. Not only did the flame retardant data attract international attention, it influenced the state's decision to ban the most widely used commercial form, DecaBDE. For this work, the state of Maine honored her with a special Citation of Recognition.

From small beginnings 17 years ago, Shaw's research institute — with marine labs, a field station and an aquarium that mimics the Gulf of Maine's ecosystem — has been gaining international recognition for its scientific leadership. And Shaw is the gently-spoken force behind those breakthroughs.

Her path to this point has been marked by a desire to understand the world, she said, to find new ways of seeing, whether

through photography, public health or marine research. She shares that understanding liberally. In the international arena, she gives papers at conferences, this year in Tokyo and Cape Town. Locally, her institute offers water quality monitoring, educational programs and an environmental lecture series.

Shaw said she feels some urgency. The United States was late to the table in recognizing the ocean crisis, she said. "I hope it's not too late."

New Brunswick Greg Thompson

Fishermen are an independent lot. And they pride themselves on it, said Greg Thompson, a lifelong fisherman of New Brunswick's waters. But over recent years aquaculture, liquefied natural gas terminal tugboats and other claims to the open ocean have encroached on that celebrated independence. The shift has not been easy.

As a founding member of the Fundy North Fishermen's Association in the late 1970s, Thompson has had fishermen's interests in his sights for years. Of the 150 or so fishermen in Fundy North almost half are members of the voluntary organization — an achievement in itself. But what particularly encourages him is their growing

awareness. "Our fishermen are a little more open to looking at the good of the fishery as a whole — open to the concept that it is a common property or resource," he said. "It's a form of maturity."

That accomplishment didn't come without decades of effort and initiative. Years ago, when the government imposed quotas to halt declining ground fish stocks, battles ensued. Each fisherman wanted at least what he or she had before, Thompson said, if not more. "We fought each other over each fish." Out of that head-to-head grew community-based fisheries management, a system Thompson helped develop. It allocates quotas to fishing communities rather than individual fishermen. The main benefit: Communities manage to keep their small fishing enterprises. That's key, he said, because when a community loses its fishery, it's like losing a school or a church — a valuable dimension disappears.

Building consensus is a theme for Thompson. It's the only way ahead, as he sees it. So as the demands on the Bay of Fundy grow — from fisheries and aquaculture to tourism and industry — he's working hard alongside others to integrate them in a marine planning process for southern New Brunswick.

Friends of Musquash

Estuaries offer a rare meeting of salt water and fresh. In that tidal mix, they support a wide range of wildlife and marine species. Musquash Estuary on the Bay of Fundy is a rarer spot still — an estuary whose ecology and salt marshes have remained largely intact over the decades. A 1990 study identified it as the only estuary in the region not subject to major development: no seaport, aquaculture, industry, dredging or residential buildup.

That confluence of conditions led the Conservation Council of New Brunswick and the Fundy North Fishermen's Association to propose making the estuary a Marine Protected Area (MPA) in 1998. In March 2007 it became an official MPA.

One of the biggest players in nudging the project forward during those years was the Friends of Musquash, a group of local residents, stakeholders and interest groups. Formed in the late 1990s, the Friends facilitated forums and coordinated with government officials over future management of the MPA.

David Thompson, the president of Friends, attributed much of the ultimate success of the venture to the perseverance of local residents, people who have lived on the edges of the estuary for generations and wholeheartedly supported the proposal.

Now that the MPA is in place, the Friends will become "the eyes and ears surrounding the estuary," Thompson said. Members will do field work the government is too understaffed to carry out and offer on-the-ground guidance and advice to Fisheries and Oceans Canada, which oversees the eight-mile (13-kilometer) estuary.

Nova Scotia Clifford Drysdale

Turtles are known to be slow. But in southwest Nova Scotia, the Blanding's variety is also a distance walker. That was one finding of the Mersey Tobeatic Research Institute (MTRI) project to advance habitat connectivity for species at risk.

The Blanding's turtle recovery team researchers worked in cooperation with staff, trustees and representatives from various levels of government. The results influenced a local logging company to set aside a patch of land to accommodate the turtles' wanderings and protect nesting sites.

It's one small example of MTRI's collaborative approach to research, said Clifford Drysdale, the institute's chairman and chief executive officer. Forestry is the primary industry in the region, yet there's an open cooperation between landowners, scientists and loggers.

That weaving of different interests is part of MTRI's role, which Drysdale described as a combination of catalyst and partner. Established in 2004 by a group of scientists with the support of industry, educators and local residents, the institute has quickly become a hub of new research, data exchange and education programs, all in the service of promoting sustainable use of resources and biodiversity conservation.

With 30 years' experience as an ecosystem science manager at Kejimikujik National Park and National Historic Site in Nova Scotia, Drysdale, now retired from Parks Canada, is in his element. Still, the public's interest and enthusiasm for the institute's volunteering and monitoring programs have been especially encouraging. It seems to have caught the imagination of the local people, he said modestly. Children meet and talk to the scientists as part of school programs. And research is openly shared with the public as a way to promote conservation.

Coastal Communities Network

The heart of the Coastal Communities Network, said Executive Director Ishbel Munro, is its ability to provide a meeting ground for a broad range of voices and views. Fishermen rub shoulders with church people, First Nation members share ideas with Acadians, and environmentalists chat with youth groups.

It's a network with a big goal: to sustain the social and economic well-being of the small communities that skirt the province's coast and dot its rural inland.

It all started with the cod crisis. In the early 1990s, the ground fishing industry collapsed and with it much of the economic fiber of the region. Munro worked on a committee that organized a series of seminars to discuss the crisis, drawing together all threads of the community. These were people who had rarely stood in the same room, let alone discussed fisheries. It was time to set differences aside, Munro said. It became the unofficial beginning of the Coastal Communities Network (CCN).

From there, CCN has grown into an information clearinghouse and generator of creative solutions for local communities. It holds rural policy forums and workshops, and gathers research that communities can draw upon to address their own needs. It also publishes a magazine and maintains a resource-rich Web site. In isolated communities particularly, Munro said, the monthly meetings can be a lifeline and offer much-needed moral support.

One of CCN's biggest successes has been its work on wharves. "They're how [you] get to work if you're a fishing person," she said, describing them as the linchpin of coastal communities. With 255 wharves in Nova Scotia, the maintenance bill has been overwhelming. CCN jumped in and helped secure federal funding. Then the network did what it excels at: it held workshops to educate people about the role wharves play in the economy and community.

Susan Llewellyn Leach is a free-lance writer based in Cambridge, Massachusetts.

For more information see:

Marine Environmental Research Institute
<http://www.meriresearch.org>

Mount Desert Island Water Quality Coalition
<http://www.mdiwqc.org>

Essex County Greenbelt Association
<http://www.ecga.org>

Blue Ocean Society
<http://www.blueoceansociety.org>

The Great Bay Stewards
<http://www.greatbaystewards.org>

Mersey Tobeatic Research Institute
<http://www.merseytobeatic.ca>

Nova Scotia Coastal Communities Network
<http://www.coastalcommunities.ns.ca/main.php>

Musquash Marine Protected Area
<http://www.musquashmpa.ca/>

OTN continued from Page 1

Canadian. The grand vision is to establish as many as 60 acoustic curtains around the world with one million marine animals sending data in real time in 14 regions off of all seven continents.

Listening curtains

In the OTN scenario, transmitter tags as small as an almond or up to an AA-sized battery are surgically implanted in animals. Battery-powered acoustic receivers about the size of a large soda bottle are attached to 200-kilogram (441-pound) steel railcar wheels or concrete blocks to anchor them to the sea floor. Placed at regular intervals about 50 to 200 receivers will form a line or listening curtain up to 50 kilometres (31 miles) long in various parts of the world. As a tagged animal approaches the listening curtain, the nearest receiver logs the tag's unique serial number, the date and time. Movement patterns of individual animals, including direction and speed, can be reconstructed using the time of detection at different receivers and other listening curtains.

Since most species stay along the highly productive continental shelves, the receivers offshore from Halifax, called the Halifax Line, will detect virtually any tagged animal heading north from the Gulf of Maine and determine if it returns. Continental shelves average about 80 kilometres (50 miles) wide and the edge of the shelves occur at an average depth of about 200 metres (660 feet) before falling off steeply into the deep sea. Salmon and many other marine animals travel extensively along the shelves. "With similar technology in use in the Pacific, we found that the curtains are about 95 percent efficient. Only one in 20 tagged fish slips by undetected," said O'Dor.

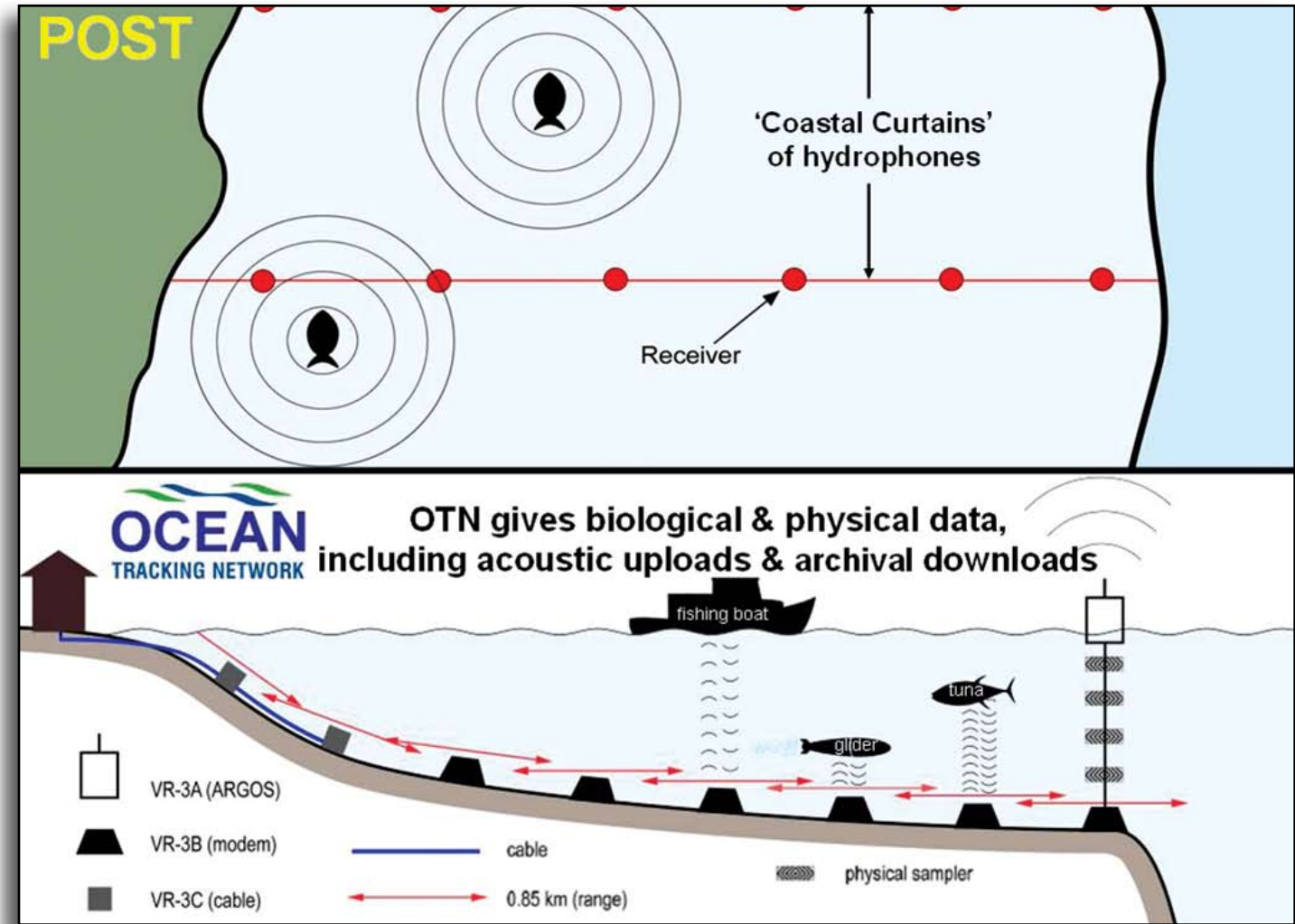


A scientist implants a tag into an anaesthetized steelhead trout smelt. Surgery procedures follow or exceed Canadian Council for Animal Care guidelines.

COURTESY: PACIFIC OCEAN SHELF TRACKING PROJECT

To date, information on fish has been received from a research vessel bouncing sonar acoustic signals off of a fish's air-filled swim bladder. But it has been difficult to get detailed information about a fish's movement, let alone the water conditions at its location.

A pilot project of receivers and fish with transmitters, called the Pacific Ocean Shelf Tracking project and stretching 1,750 kilometres (1,087 miles) from Oregon through British Columbia and north to the Alaskan panhandle, has been demonstrated successfully. The project, part of the international Census of Marine Life,



The Ocean Tracking Network combines marine life and environmental data using tags implanted into marine animals, whose presence is detected by underwater listening arrays. That information is then transmitted back to scientists onshore. A successful test of the technology was conducted by the Pacific Ocean Shelf Tracking Project.

COURTESY: PACIFIC OCEAN SHELF TRACKING PROJECT

discovered for the first time that young Pacific salmon suffered high mortality rates along coastlines and not just in their natal rivers. On the East Coast of North America, Atlantic salmon populations remain in trouble. There have been high levels of mortality during migration in recent years. The cause remains a scientific mystery.

Unraveling migration mysteries

About 350 salmon smolts on the East Coast of North America along with striped bass, American eels and shad already have been tagged with transmitters as part of other tracking projects, said John Kocik, research fishery biologist at the National Oceanic & Atmospheric Administration's Northeast Fisheries Science Center in Orono, Maine. "The OTN will greatly enhance our ability to know where our tagged fish are going."

Peter Smith, an oceanographer at the Bedford Institute of Oceanography in Halifax who is in charge of installing the Halifax Line, said he is waiting for new equipment. In the Pacific the receivers can only upload their data to boats passing overhead, thus requiring regular visits. The Atlantic portion of the OTN will incorporate an improved idea: "daisy chaining." That means receivers in the Halifax Line placed roughly 800 metres (2,625 feet) to 1,000 metres (3,282 feet) apart will transmit their data acoustically from the furthest out to the next one closer to shore and so on until the data are relayed by a cable system to Halifax, and with only a few seconds' delay.

"We'll also supplement the receivers

with other sensors to get more information about currents and temperatures," said Smith. "It will be a window on what's going on down there."

The data from the Halifax Line as well as all other electronic curtains will be uploaded via the Internet to the OTN central database in Halifax, enabling scientists from around the world to understand animal movements. This data will be invaluable to detect behaviour changes as the oceans warm due to climate change. It also may be possible to follow the spread of invasive species.

Dalhousie also plans in 2008 to place

several antennas onto Gulf of Maine Ocean Observing System (GoMOOS) buoys in the Gulf of Maine. Those antennas will be able to upload data from the receivers on the ocean floor and relay it to satellites that in turn will send it to computers in the GoMOOS network on shore, said Mike Stokesbury, a biologist at Dalhousie working on the OTN project.

"It's all a little overwhelming," said Stokesbury.

Stephen Leahy is an environmental journalist in Toronto, Canada.

Visionaries continued from Page 1

elemental draw for most of us, particularly in Maine, then we're going to work for it," he said.

His first official foray into buoying island life was the Cliff Island Corporation for Athletics, Conservation, and Education — a name worthy of Wall Street but better known to locals as ACE. Berle founded ACE in 1977 and built a sense of community and teamwork through weekly ball games.

ACE's goal was to bolster that spirit and foster a sense of stewardship for the tiny island, an ethic that included protecting the open land and resources. ACE also brought interns to the school and families to live on the island.

Cliff Island faced its own crisis in the 1970s when the island school slipped below the minimum eight pupils required to keep state funding. If the school closed, more residents would leave and the population would sink more. The solution came in the form of a welfare family with six children and an island community willing to pitch in and renovate a home for them that Berle had purchased.

That kind of creativity is a hallmark of Berle's modus operandi. In a more recent example of his innovativeness, Oceanside Conservation Trust (OCT), the land trust he has served on for 25 years, recently became part of a collaborative with two other trusts to pool resources and focus efforts.

The spur for creating Portland North Land Trust Collaborative came in the late



Longard Award winner Roger Berle and Elizabeth Hertz of the Maine Coastal Program at the award ceremony.

PHOTO: LORI VALIGRA

1990s when pressure on island and coastal property from deep-pocketed developers was huge and the offers "outrageous," as Berle put it. By contrast, for 15 years OCT had been operating at a glacial pace and wary of financial risk. The collaborative's plan is to respond faster to opportunities.

When it comes to conservation, the bottom line for Berle is that you're either going forward or moving back. There's no standing still.

Susan Llewelyn Leach is a free-lance writer based in Cambridge, Massachusetts.

Can you hear me now?

Water transmits sound five times faster than air and is an ideal environment for acoustic communication as used by whales, dolphins and other marine animals.

The Ocean Tracking Network's acoustic tags implanted in animals transmit a series of ultrasonic sound "pings" called a pulse train that contains a code. An individual marine animal with its own code can then be identified when it comes close enough to a receiver, which is

essentially an underwater microphone.

All tags are tested before use to make sure their ultrasonic pinging doesn't attract predators or affect other species.

The tags are not removed from the marine animals, and depending on the size, tags operate for 18 months to several years before batteries die.

For more information see the Ocean Tracking Network at <http://www.ocean-trackingnetwork.org/> and the Pacific Ocean Shelf Tracking project at <http://www.postcoml.org/>.

Book Review
Soaring with Fidel

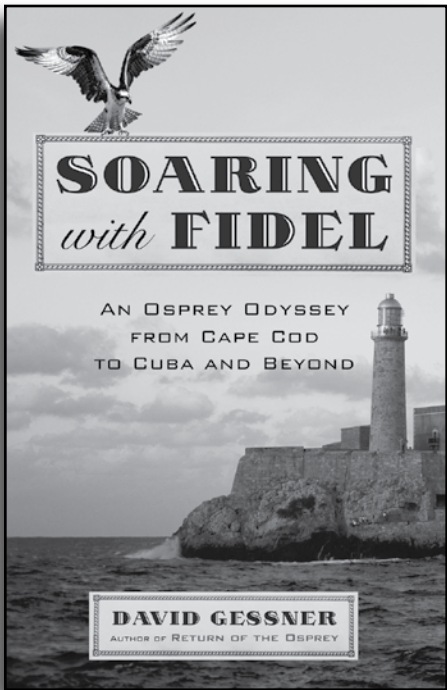
By Lee Bumsted

“I felt lucky to have stumbled on this particular bird as my obsession,” writes David Gessner in *Soaring with Fidel: An Osprey Odyssey from Cape Cod to Cuba and Beyond*. This obsession leads him to follow the osprey’s lengthy migratory path one autumn. His journey turns out to be as much about getting to know osprey people as it is about studying the birds themselves.

Gessner had observed nesting pairs of ospreys near his home on Cape Cod and written *Return of the Osprey: A Season of Flight and Wonder* a few years before. This time, he decides he’ll visit prime viewing spots on the osprey migration route along the eastern seaboard of the United States. He also gets in touch with a Cuban scientist, Freddy Santana, who has discovered that ospreys migrate in flocks along the mountain ridges of southeastern Cuba. The chance to see them soaring in groups is irresistible, so he jumps at Santana’s invitation to visit, despite the difficulties of traveling between Cuba and the United States.

Coincidentally, a few ospreys are nesting on Cape Cod and nearby Martha’s Vineyard with radio transmitters the same season the author undertakes his personal migration, and their locations are posted on a Web site. Gessner nicknames one of the radio-tagged birds Fidel. He hopes to be present if Fidel flies over La Gran Piedra near Santiago, Cuba. Freddy Santana makes Gessner welcome on this mountaintop observation point. While he doesn’t approach Santana’s record of spotting 607 ospreys in one day, he nevertheless becomes absorbed in his visual hunt.

Despite a certain lack of planning, or perhaps because of it, Gessner falls in with all kinds of ornithologists and amateur observers. Serendipity and the kind-



Soaring with Fidel:
An Osprey Odyssey from
Cape Cod to Cuba and Beyond

By David Gessner

Beacon Press

289pp., \$24.95

ness of strangers are key to his adventures. Santana is just one of the many members of the osprey “tribe” who invite Gessner to meals, set him up in cabins overlooking salt marshes, take him to productive watch sites and generously share their knowledge and contacts. Gessner spends an afternoon on Long Island with a couple of dozen virtual birders who have been glued to Web cam coverage of an active osprey nest. Young interns at the Cape May Bird Observatory in New Jersey offer him a pasta dinner and a couch to sleep on before an early morning counting birds. He is clearly fascinated by these people whose lives are intertwined with those of ospreys.

Gessner is also quite taken with the birds themselves. “Dives are what osprey

watchers live for, and this one was something, a brilliant ballet move,” he writes. “Backlit by the sun, its feathers ruffled and wet from an earlier dive, the bird looked enormous. It hovered in front of us, readying, the wings beating fast, 50 feet above the surf. Then the plunge down...gaining speed and then kicking its legs back right before striking the water, popping a wheelie, hitting hard, splashing the surface. It came up empty once, twice, shaking itself like a dog. But on the third try it rose clutching a fish in its talons, spraying down a silver-lit waterfall.”

While *Soaring with Fidel* is primarily an eloquent appreciation of ospreys and the people who watch them, Gessner does provide insight into osprey migration practices. He quizzes Keith Bildstein, the director of conservation science at Pennsylvania’s Hawk Mountain, during his visit there. Bildstein explains that migration is driven by the availability of fish near the surface of the water, not the weather per se. Ospreys soar using thermal and mountain updrafts to efficiently cover the thousands of miles between their nesting and wintering grounds, which can be as far away as South America. As Bildstein tells Gessner: “They are predisposed to migration because their manner of transportation is one of the most effective ways of moving, not only over long distances but over long distances in short periods of time. So they can move from one good place to another good place and they can do it *fast*.”

Although he has moved south himself to take a position teaching creative writing at the University of North Carolina at Wilmington, Gessner brings his “osprey odyssey” full circle by traveling back to Cape Cod and Martha’s Vineyard the following spring. He hopes to catch sight of Fidel and watch the nesting season, and another migratory cycle, begin again.

Lee Bumsted writes on conservation and outdoor recreation topics from South Portland, Maine.

Off Limits: Inside the
Gulf of Maine Closure Area

By Kirsten Weir

Untold generations of New England fishermen have made their livings in the fish-rich waters of Jeffrey’s Ledge. Left behind by a glacier at the end of the ice age, the rocky ledge roughly parallels the coast for 33 miles or 53 kilometers from Massachusetts to Maine. The ledge itself is relatively shallow, but its edges drop off sharply. At these margins, currents well up from the depths, carrying nutrients that fuel a diverse marine ecosystem.

Over the last decade, however, tightened fishing regulations have placed much of this storied ledge off-limits to commercial fishermen. Now, scientists and fisheries managers are taking a careful look at the Western Gulf of Maine Closure Area, hoping to understand how it has affected both the fishing industry and the ecosystem. In March 2007, scientists, regulators, fishermen and others met at a symposium at the University of New Hampshire (UNH) to discuss the effects of the closure.

The number of cod in the Gulf of Maine plummeted by nearly half from 1986 to 1996. Hoping to stem the crisis, the New England Fishery Management Council implemented a number of regulations, from increasing the size of mesh used in nets to limiting the number of days fishermen could spend at sea. In 1998, the Management Council created the Western Gulf of Maine Closure Area. The 1,100-square-mile (2,849-square-kilometer) zone, containing much of Jeffrey’s Ledge, was closed to commercial groundfishing.

Habitat protection

Initially, the closure was established simply to reduce the number of cod being caught, Tom Nies, a senior fishery analyst at the Management Council, told the symposium audience. “It was chosen to be closed because people were catching a lot of fish there,” he said. The Council’s original plan was to shut the area for three years. But over the years, a series of amendments extended the closure indefinitely and added an explicit habitat-protection component as well. The Western Gulf of Maine Closure Area’s goals now include protecting essential fish habitat in addition to allowing cod stocks to rebuild.

Nine years after the closure area was established, scientists are beginning to understand the effects it has had on the habitat and the fishery. But piecing together the puzzle is no small task. Possible effects of the closure are confusingly intertwined with the effects of regulations on net mesh sizes, days-at-sea limitations and catch limits. Also, as Gulf of Maine Research Institute scientist Jonathan Grabowski pointed out, no detailed baseline studies were done before the area was closed. Scientists can compare habitat inside and outside the closure, but they can’t compare present conditions there to those of the recent past.

Still, scientists are starting to draw some broad conclusions. For instance, UNH zoologist Ray Grizzle found that on the rocky seafloor habitat common to Jeffrey’s Ledge, invertebrate creatures such as sea squirts, sponges and anemones were more abundant inside the closure than just outside it.

“There’s a basic understanding that the habitats are recovering,” Grabowski explained in an interview. Still, it’s not clear how that recovery is affecting cod and other commercially important groundfish. He’s studied how the closure may affect juvenile fish. In general, he said, juvenile groundfish tend to hang out in structured habitat, the gravelly bottoms and rocky ledges where they can hide from predators and forage for food. But the link between

Whale strike continued from Page 1

based nonprofit, informed us it was a “minke whale.” Our luck held with more minke whale sightings and then a fin whale sighting, an endangered species that is nothing to snuff at: it’s the second-largest animal on earth, second only to the blue whale. At up to 70-feet (21-meters) long, it’s about as big as 13 human adults laid head to feet.

An uncommon sighting

Towards the end of the day on our way back to Rye Harbor, New Hampshire, the Atlantic Queen came to a halt once again. It was a fin whale. The spout rose above the ocean as the whale surfaced to breathe, showing us its shiny black back. We were told that we were only seeing a very small part of the gigantic body. What a great ending to the day, or so we thought.

When a small sport boat came out of the corner of my peripheral vision I thought, “Geez, that guy is getting awfully close to that whale.” The loudspeaker said, “This boater is not obeying whale watch regulations. He’s way too close.” Then he went right over the place where we had last seen the whale surface.

When the whale came up again, bleeding slash marks were clear on the shiny black skin. There was a silence, and then Kennedy’s voice over the loudspeaker, “Never in my 12 years of whale watching experience have I ever seen this happen.”

My little sister said she felt sad. The crowd seemed shocked and then angry. As the Atlantic Queen pulled up alongside of the sport boat to get documentation for the authorities, my mother yelled, “Do you know you hit a whale?” The boat’s operator didn’t respond.



Cathy Coletti and her “little sister” Haley aboard the whale watch cruise.

PHOTO: TERRY ALLARD

Sharing the waters

What a sobering reminder that we share our ocean. As I sat with the reporter from *Fosters Daily Democrat*, I told her about how I would like to see this fin whale be an ambassador for his species. That through press coverage and word of mouth, the whale could simply tell us “Slow the heck down out there and watch out, we’re here too!”

It was prime boating season, which also coincides with the movement of fin, humpback, minke and other whale and dolphin species, which come to the Gulf of Maine to feed on schooling fish and krill.

Harming an endangered species of whale is a violation of both the Marine Mammal Protection Act and the Endangered Species Act, with fines of up to

\$50,000, along with imprisonment and seizure of the vessel.

The captain of the Atlantic Queen and Kennedy of the Blue Ocean Society reported the incident to the authorities, and in mid-September, National Oceanic and Atmospheric Administration investigators found the boat driver in violation of the Marine Mammal Protection Act. The driver was charged an \$8,500 fine, and had 30 days from the notice of the charge to contest it, work with the attorneys to come up with a different amount, or pay the whole fine.

The whale has not been seen since the strike. Right now no one can be sure of its condition, but Blue Ocean does sometimes observe whales with scars.

Updates on the case and news on the whale’s condition can be found at: <http://www.blueoceansociety.org/finstrike.htm>.

Cathy Coletti is assistant editor of the Gulf of Maine Times.

Spotlight on fin whales

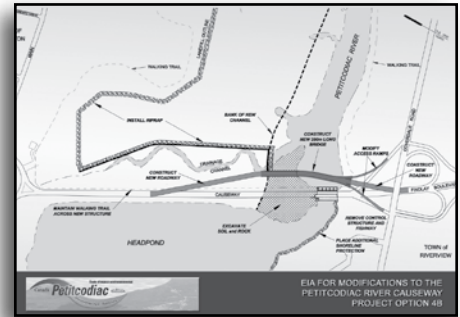
Fin whales are the second-largest species ever to live on the Earth. They are 60 feet to 70 feet (18 meters to 21 meters) long on average. The largest one measured was a female that was longer than 80 feet or 24 meters. They weigh 40 tons to 50 tons (about the weight of 12 elephants put together). Although they are an endangered species, Blue Ocean Society in Portsmouth, New Hampshire, sees them on about 80 percent of its whale watch trips.

SOURCE: BLUE OCEAN SOCIETY

New Brunswick to restore Petitcodiac River

The Petitcodiac River in southern New Brunswick will be restored to a major portion of what it was before a causeway, or a raised road above water, was installed across the river in 1968, province representatives said in August. Supply and Services Minister Roly MacIntyre said the province prefers to replace the Petitcodiac River Causeway with a 280-meter (919-foot) bridge costing about C\$68 million (US\$64 million). “It offers the most positive environmental benefits for the river,” he said in a statement. “The next step is to secure a federal/provincial funding agreement.”

The preferred option includes permanently opening the gates to allow fish passage and constructing the new bridge immediately downstream of the existing bridge. Once the new bridge is completed, the existing gates structure will be removed to allow for an eventual river opening of between 72 meters and 225 meters (246 feet and 738 feet) wide.



Petitcodiac River restoration.
SOURCE: COMMUNICATIONS NEW BRUNSWICK

Subject to a partnership agreement, the work will be carried out in three phases: two years for planning and site preparation; two years for opening the gates and environmental monitoring of the river; and three to four years for construction of the new bridge, depending on funding support and seasonal weather conditions.

The Petitcodiac River restoration is environmentally sensitive and must be carried out according to the conditions set by the provincial Department of Environment. Before the gates can open, planning, re-

mediation work and site preparation has to be done to prevent erosion along the river. Once the gates are open, the seasonal response must be monitored for two annual cycles as the river, fish populations and the surrounding habitat adjust to the change.

The Atlantic Salmon Federation (ASF) and the New Brunswick Salmon Council (NBSC) commended the move by the province. “While this was a difficult decision for the province, it is certainly the only environmentally correct decision,” said Patricia Edwards, ASF’s regional director for New Brunswick.

In a statement, the ASF and NBSC said that since its construction in 1968, the Petitcodiac causeway and its various fishways have contravened the Federal Fisheries Act by restricting or eliminating passage of all fish species. Countless efforts over the past four decades to improve the fishways at the causeway failed to provide adequate fish passage for any species, including the Atlantic salmon.

Prior to 1968, the two groups said the Petitcodiac River supported a run of 2,000 to 3,000 salmon annually, but after the causeway was completed the Petitcodiac run dwindled to mere hundreds of salmon. This decline preceded the precipitous crash of Inner Bay of Fundy (IBoF) salmon stocks. Those salmon are now listed as “endangered” under the Federal Species at Risk Act.

“While we are not suggesting that the causeway was the principal cause for the decline of IBoF salmon stocks as a whole, it definitely contributed greatly to the species decline in the Petitcodiac River,” said Gary Spencer, president of the NBSC. “As long as the causeway remains in place, salmon cannot ascend the river regardless of how strong the stocks are. The sooner the proposed bridge is in place and the causeway and its gate and fishway structures are dismantled, the sooner we can start restoring wild Atlantic salmon populations to their natural range in the Petitcodiac.”

For more information see: <http://www.gnb.ca/cnb/news/ss/2007e1005ss.htm> and <http://www.asf.ca/news.php?id=106>.

Resources

for and about the Gulf of Maine



Conservation stories on Maine’s coast

Coastal Choices is a series of video stories that demonstrate how five diverse coastal communities in Maine have taken creative measures to enhance community life and sustain economic health through land conservation. Each story is designed to help individuals and communities work together to protect threatened coastal resources. The videos and supporting materials are at the Maine Coast Protection Initiative Web site at: http://www.mcht.org/mchtnews/other/2007/05/learn_from_five_stories_on_mai.html. The series includes an introduction by marathon runner Joan Benoit Samuelson. Each video is six to eight minutes long, and each is supplemented with a two-page write-up with references to related Web sites. The five stories are:

1. Wild Island: Sustaining a legacy of conservation on Monhegan
 2. Uncharted Waters: Saving a working waterfront in York
 3. Learning Ground: Linking school and community in Lubec
 4. Spawning Hope: Collaborating to conserve mid-coast river
 5. Healthy Trails: Connecting people and parks in Portland
- The project was made possible by a grant from the Maine Coast Protection Initiative.

Climate Change Action Plan 2007 - 2012

The government of New Brunswick has issued a 36-page *Climate Change Action Plan 2007 - 2012* that outlines the province’s vision for reducing greenhouse gas emissions and managing climate change impacts through a series of targets and policy actions as well as engagement of stakeholders and the public. It charts the province’s path to sustainability in a changing climate. It can be downloaded in PDF format at: <http://www.gnb.ca/0009/0369/0015/0001-e.asp>.



Salt marsh restoration in Maritime Canada

A report entitled *Examining Community Adaptive Capacity to Address Climate Change, Sea-level Rise and Salt Marsh Restoration in Maritime Canada*, submitted to the Climate Change Impacts and Adaptation Program, is available at: http://www.mta.ca/rstp/CCIAP_Project_A1106_Final_Report1.pdf.

The report focuses on the ecologic, economic, social and policy conditions under which a community might employ dyke removal and salt marsh restoration as an adaptive response to future climate change and sea level rise.

Calendar

October 21 – 23

Ocean Innovation 2007, with the theme “The Rise of Maritime Simulation,” will include sessions on: Navigation and Pilotage, Ports and Waterways, Training Systems and Human Performance. It will be held in Halifax, Nova Scotia. For more information email Clayton Burry at cburry@ccmc.nf.ca or see <http://www.oceaninnovation.ca/>.

October 24 – 26

Climate 2050 will be hosted by the Veolia Environment Institute (France), the Pew Center on Global Climate Change (USA) and the National Round Table on the Environment and the Economy (Canada). The objective of the conference is to generate discussions to improve understanding of long-term climate change strategies that will lead to meeting 2050 targets. The conference program is designed to connect research, business and policy and identify solutions to various sectoral and regional climate change challenges. It will be held in Montreal, Quebec. For more information see: <http://climat2050.org/>.

October 24 – 27

The OMRN 2007 National Conference of the Ocean Management Research Network will emphasize four themes: Ocean Agenda Implementation, Canada’s North and the Arctic Ocean, Impacts and Adaptations of Coastal Communities and Canada’s Oceans and Climate Change. It will be held in Ottawa, Ontario. For more information see: <http://www.omrn-rngo.ca/index.php?action=conference.index>.

October 29 – November 1

Fourth Symposium on Harmful Algae in the U.S. will provide a forum for scientific exchange and technical communication on harmful algae bloom research in the United States. It will be hosted by the Woods Hole Oceanographic Institution and held at the Marine Biological Laboratory in Woods Hole, Massachusetts. For more information see: <http://www.whoi.edu/sbl/liteSite.do?litesiteid=13352>

November 4 – 8

The 2007 Conference of the Estuarine Research Federation will focus on “Science and Management: Observations, Synthesis, Solutions.” The goals of the conference include sharing knowledge in core disciplines and stimulating synthesis and interdisciplinary discussion, getting students involved by providing networking resources and opportunities, integrating international perspectives through participants worldwide and encouraging interactions and collaborations among federation members. It will be held in Providence, Rhode Island. For more information email Jonathan Pennock at jonathan.pennock@unh.edu or see <http://www.erf.org/>.

The *Gulf of Maine Times* is made possible in part by a grant from:



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Shipping lanes shifted to protect whales

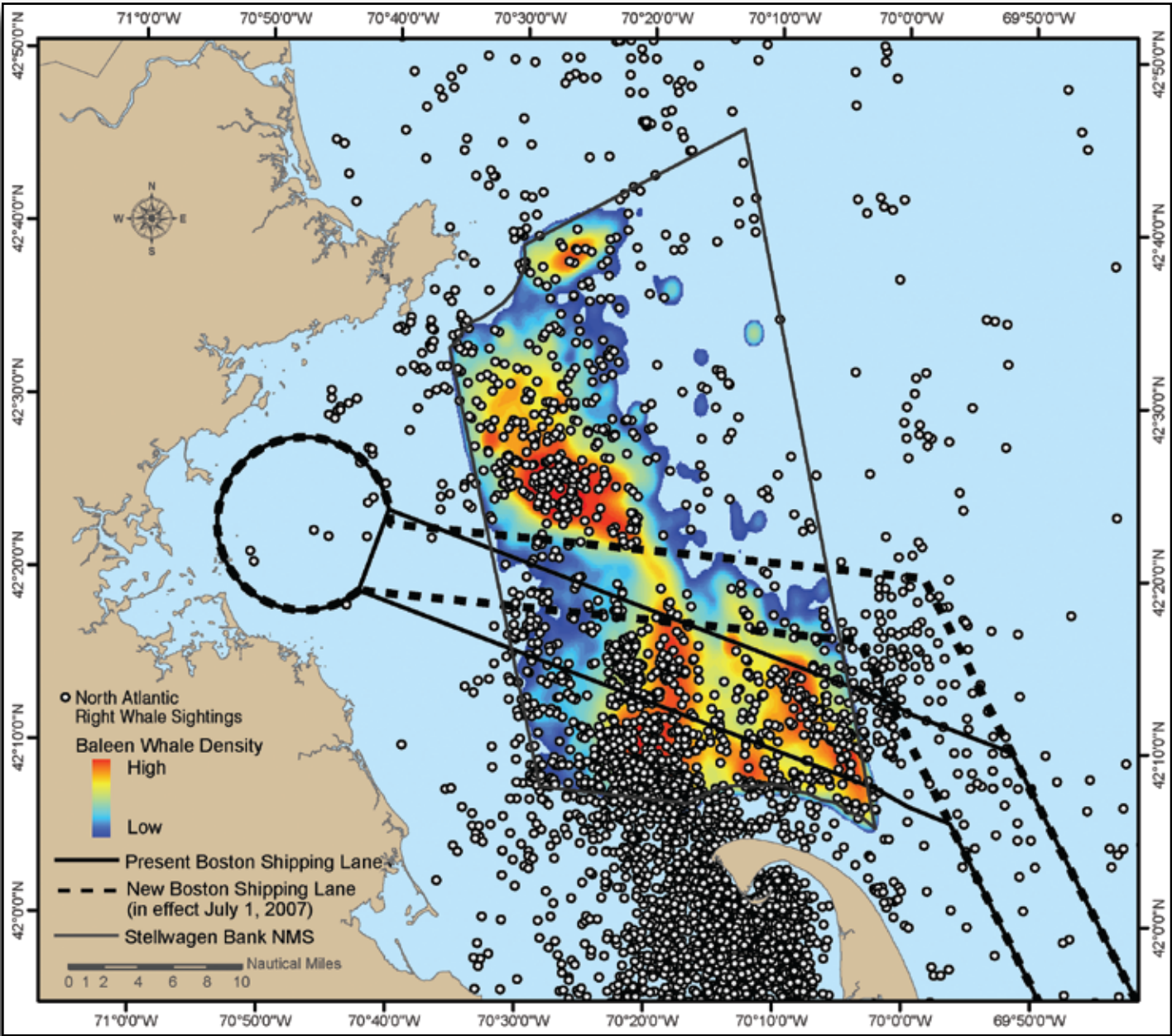
Changing the location of officially sanctioned shipping lanes into and out of Boston is not something that can be easily done - the consequences affect not just American vessels but international commerce. Shipping lanes are assigned by the International Maritime Organization (IMO), a part of the United Nations. But a Stellwagen Bank National Marine Sanctuary-led proposal to move the Boston lanes, also known as the Traffic Separation Scheme (TSS), to better protect feeding whales on Stellwagen Bank and in Massachusetts Bay won overwhelming support at an IMO meeting in late 2006. A less dangerous course was approved with a July 1, 2007 implementation date.

Using a 25-year database of more than a quarter of a million whale sightings from whale watch and whale research trips, sanctuary scientists showed that the heaviest concentrations of whales were located directly in the shipping lanes. The probability of future sightings in these areas was substantiated by ecological studies. Most of the whales target sand lance, a small schooling fish, which prefers the sandy sediments that predominate in areas with historically high whale sightings. For endangered North Atlantic right whales, which feed on small planktonic crustaceans, prevailing currents push their food into Cape Cod Bay and into the southern portion of the sanctuary where the lanes were located.

To mitigate the ship strike threat to great whales, the sanctuary, the National Oceanic & Atmospheric Administration's Fisheries Service and the U.S. Coast Guard proposed that the lanes be narrowed and moved a few miles northward. Calculations indicated that for most vessels, the change would only add a few minutes to vessel transit times, but would dramatically reduce the potential of a ship hitting a whale — 81 percent for all whales (humpback, fin, minke, northern right) and 58 percent for the critically endangered North Atlantic right whale. The shipping industry also voiced their support for the northward shift of the lanes.

This potentially far-reaching marine mammal conservation effort was made possible by the donation of whale sightings data from the Provincetown Center for Coastal Studies, the Whale Center of New England and the North Atlantic Right Whale Consortium.

A version of this article appeared in Stellwagen Soundings, Summer 2007. Reprinted with permission.



Shipping lanes changed to the hashed lines. The “o” marks indicate North Atlantic right whale sightings.

MAP: NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION/STELLWAGEN BANK NATIONAL MARINE SANCTUARY.



Tanker with humpback whales in the foreground before the shipping lane shift took effect in July 2007.
PHOTO: WHALE CENTER OF NEW ENGLAND (STELLWAGEN BANK NATIONAL MARINE SANCTUARY FILE PHOTO TAKEN UNDER NOAA FISHERIES PERMIT # 981-1707-00).

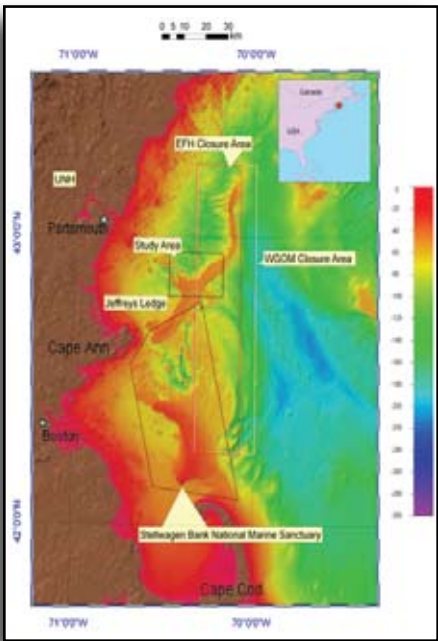
Closure continued from Page 9

seafloor recovery and the health of groundfish populations isn't straightforward. In separate studies, both Grizzle and Grabowski caught cod inside the closure area, but they both hauled in fewer juveniles than they expected to find.

Impact on adult groundfish

Other researchers have focused on adult fish. Recent studies have suggested the closure area has had little impact on the movement patterns of adult groundfish in the region. Cod in particular are very mobile and may not be spending enough time inside the closure area to reap the benefits of protection.

While the jury is still out on whether cod benefit from the closure, evidence suggests that local fishermen may not. At the UNH symposium, Massachusetts



Institute of Technology anthropologist Madeline Hall-Arber said she has found

The Western Gulf of Maine (WGOM) fish closure area, essential fish habitat (ESH) closure area, Stellwagen Bank National Marine Sanctuary and University of New Hampshire (UNH) study area. The color in the image represents the bathymetry (depth). Deeper areas generally are cooler colors like blue and shallow areas are in red. Land areas are in brown.

COURTESY: MASHKOOR AHMAD MALIK, UNIVERSITY OF NEW HAMPSHIRE.

that increasingly strict fishing regulations have created hardships for the owners of small vessels, and placing much of Jeffrey's Ledge off-limits has affected the way many have fished for generations. For example, she said, the closure has encouraged small boats to fish farther offshore than is safe for vessels of their size.

Hall-Arber said many fishermen recognize the importance of rebuilding the

fish populations, but they'd like to be sure that the regulatory red tape is having a positive impact.

When it comes to the closure area, it may be a while before the picture is clear. Researchers agree that more work is needed to understand the closure's impact. For now, it remains closed indefinitely.

"You can often document changes in the habitat. You can see more things growing on the bottom, more diversity of species," Nies of the New England Fisheries Management Council said in an interview. "The big question that is hard to unravel is 'What does it do to the [groundfish] resource as a whole?' Quite honestly, I think it's going to take time to figure out the answers."

Kirsten Weir is a free-lance writer in Saco, Maine, who focuses on science, health, and the environment.

On the trail of invasive species

By Peter J. Hanlon

Deep-sea biologists have multi-million dollar submersible vehicles. Physical oceanographers rely on networks of satellites and buoys. And marine invasive species experts use spatulas and nets. Clearly the latter are not the gear-heads of the marine research world.

Despite the lack of high-tech equipment, the search for non-native species has an international appeal. Organisms from literally any point on the globe can be transported to the Gulf of Maine through the ballast of cargo ships, the baitfish industry, the release of aquarium pets into the wild and fouling on the bottom of recreational boats.

It's a big step for a handful of hitchhiking organisms on a cargo ship to transition from pioneers to reproducing population, but unfortunately the Gulf of Maine is full of examples of species that have made the leap. Introduced species such as the European green crab and Asian shore crab prey on commercially valuable shellfish throughout the Gulf. The green algae *Codium fragile* (also known as "dead man's fingers") has been known to replace entire kelp and eelgrass beds within New England and Atlantic Canada. A fast-growing tunicate (*Didemnum sp.*) was found in 2003 to be smothering a large area of the continental shelf like a mat on the productive scallop fishing beds of Georges Bank.

Making an ID

Researchers are aware of the many ways that non-native species can find their way into Gulf of Maine waters, but the question of which invasive species exist within the Gulf is difficult to answer. Since 2000, a team of scientists from throughout the United States, Canada, the Netherlands, Brazil, Wales, Italy and South Africa have participated in three "rapid assessment surveys" of marine invasive species in the northeastern United States coordinated by the Massachusetts Bays Program and MIT Sea Grant.

The weeklong surveys are invaluable opportunities for taxonomic experts to quickly and accurately identify marine species and determine whether they may be newly introduced organisms that threaten the Gulf of Maine's ecosystems, and if they are introduced, where they are from and how they got here. Since the scientists monitor the abundance of both native and non-native species, they are also able to examine how the presence of introduced species is affecting the native ecosystem.

The third and most recent rapid assess-

ment survey was conducted in July 2007. A team of 20 scientists spent eight days visiting 17 sites stretching from Woods Hole, Massachusetts to Rockland, Maine. The team visited permanently floating docks and piers at each site, ensuring that they examined a structurally similar habitat type at each location likely to have a variety of marine organisms and several years of growth underneath. The docks and piers selected were also located in areas likely to have numerous pathways for non-native species to be transported, such as active shipping ports.

On the road

With such a large crew and demanding schedule, the days were planned down to the minute. Each day started out with an early wake-up at the scientists' hotel. After a quick breakfast, the crew loaded into two vans and headed to the day's first site. As one might expect of vans full of taxonomists, conversations steered towards, well, taxonomy, with the occasional friendly scientific jousting.

Once at the site, the scientists poured out of the vans, found a spot on the docks and, for the next hour, lay down at the edge of the dock and scraped as many organisms (both native and non-native) from the sides as they could find. The equipment used was simple — spatulas to scrape the organisms off and a net to catch them.

Sometimes the organisms were attached to ropes and buoys — or in one case a long stretch of plastic sheeting — that were dragged onto the dock for examination. One scientist brought his wet suit and snorkeling gear to collect and photograph species that prefer the relative darkness under the docks.

Many of the common organisms could be identified right away and were put back in the water. A team member recorded the identified species. A representative sample of all the organisms found at each site was collected in a plastic bag and taken back to the lab that evening for identification.

It was common to see researchers huddling together over a stretch of rope that had just been hauled up, blanketed with brightly-colored organisms, and discussing the identity of the attached species. Most of the scientists had distinct areas of expertise and brought jars to collect specific organisms of interest. So when, say, a club tunicate was found, a research assistant would grab a sample and bring it to the ascidian (sea squirt) expert.

After an hour or so, the researchers began to organize their findings and headed back to the vans to gulp down some cold



Invasive species expert Jim Carlton of Williams College about to investigate a strand of kelp pulled from below a pier.

PHOTO: PETER HANLON

drinks — no small detail during a late July heat wave — and hit the road to inspect another site, sometimes a few hours' drive away. By late afternoon, the group had visited three sites.

Once back from the field, the day was far from over. The scientists headed off to the lab where they remained for up to six hours on some nights with only short breaks for pizza or Chinese or whatever quick dinner awaited them. The researchers took shifts identifying the species under a stereo microscope, which allows viewing in three dimensions. The generalists wrote down the species that they knew and passed on any questionable finds to the specialists. Once all of the species were identified, a sample of the organisms found at each individual site was placed in a jar as a permanent record to be kept in a museum.

Many of the non-native species documented during the 2007 survey had been observed in the previous two surveys (see sidebar), but this year did reveal an alarming discovery: the northward expansion of *Grateloupia*, a non-native red seaweed, into Cape Cod Bay and at a survey site in Boston. The significance of this new species isn't yet understood, but it may impact other native seaweeds.

Next steps

While the survey was successful, it is just one of the steps in the fight to control the spread of marine invasive species. The goal of those involved is to continue their research by repeating the process every several years to keep pace with po-

tential future invaders and their impact on native species. To fill the gap between surveys, several citizen volunteer monitoring programs have been established recently within the Gulf of Maine, and survey organizers continue to hold workshops for coastal scientists, managers, government agency personnel and graduate students to give them the skills necessary to identify non-native species.

Equally important is the effort to develop management plans and rapid response protocols to address any new non-native species in the Gulf, a task headed by organizations such as the Northeast Aquatic Nuisance Species Panel, Massachusetts Aquatic Invasive Species Working Group and Maine Marine Invasive Species Working Group. Prevention is the focus of the plans, but should a new harmful species be introduced, a rapid response protocol is needed to let federal, state and local officials know what technologies they have available to prevent an emergency.

Scientists monitoring non-native species in the Gulf of Maine may not have the elaborate high-tech equipment required by other marine researchers. Instead, regional and international cooperation among coastal scientists and managers — armed with a few spatulas — is the best way to effectively prevent and control future invasions in our borderless marine ecosystems.

Peter Hanlon is outreach and policy coordinator for the Massachusetts Bays Program in Boston, Massachusetts.

Examples of invasive species found on the most recent census



PHOTO: ADRIAAN GITTENBERGER

European Green Crab (*Carcinus maenas*)

Where is it? Established from Delaware to Nova Scotia, it is the most common crab species in many locations throughout this range.

Why is it a problem? One of the Gulf of Maine's dominant benthic predators, it feeds on clams, oysters, crabs and mollusks and often is blamed for the collapse of Maine's soft shell clam industry.



PHOTO: ADRIAAN GITTENBERGER

Sheath Tunicate (*Botrylloides violaceus*)

Where is it? Its range stretches from the Gulf of Maine to Florida.

Why is it a problem? It can grow over other organisms such as shellfish, competing for food and resources and possibly leading to the other organisms' death.



PHOTO: ADRIAAN GITTENBERGER

Colonial Tunicate (*Didemnum sp.*)

Where is it? Spreading in the Gulf of Maine, it was first observed in Maine and Woods Hole, Massachusetts, in 1988, and since has been reported from Maine to Connecticut.

Why is it a problem? It grows over a variety of surfaces, altering marine habitats and threatening to interfere with fishing and aquaculture. It grows aggressively over bivalves and may smother them or interfere with their growth, and has no known predators.



PHOTO: JAY BAKER

Green Fleece Algae (*Codium fragile*)

Where is it? It covers a region from the Gulf of St. Lawrence to North Carolina.

Why is it a problem? When this species becomes established in shellfish beds, wave energy can lift the algae. As the algae floats away, it carries its host shellfish away from its normal habitat, resulting in another common name for this species, "oyster thief."