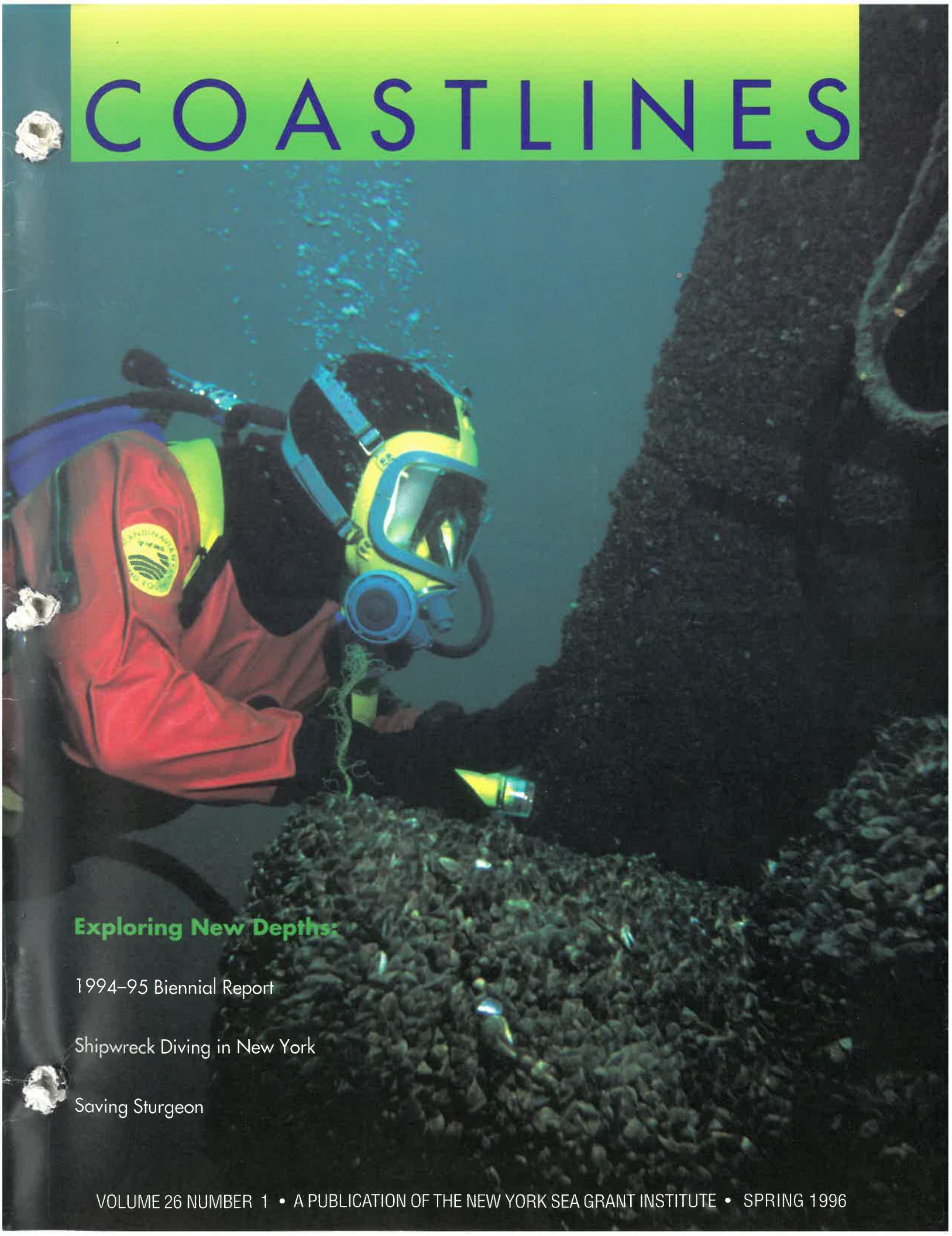
COASTLINES



Exploring New Depths:

1994–95 Biennial Report

Shipwreck Diving in New York

Saving Sturgeon

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COASTLINES

Sea Grant
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Cover Photo: Wreck of the Mary Kay by Philip Church

From the Director:

It is my pleasure to introduce "Exploring New Depths," the spring issue of COASTLINES celebrating some of the many ways New Yorkers enjoy the coast. With warmer weather finally here, being able to get back into and on the water is a welcome relief from one of the stormiest winters on record. In addition to reporting on many timely issues facing our coastal resources, this issue of COASTLINES also provides highlights of Sea Grant activities during 1994 and 1995, serving as a report on our last biennium.

As you can see from the varied programming efforts of Sea Grant's extension staff and wide focus of the research program, Sea Grant is an active player in most issues of importance to New York's coast. This will be the last issue of COASTLINES printed under my leadership as director. In July, I will be stepping down to resume life as an academic research scientist and an associate professor at the Marine Sciences Research Center. Looking back, I am proud of the work Sea Grant has accomplished under my direction. As described in this report, we have an extension program providing vital information to the public and coastal user groups, helping them to adapt to changing economies of doing coastal-related business and become good stewards of New York's magnificent coastal resources. New York Sea Grant is also fortunate to have some of the best minds in the country committed to researching coastal issues, helping to provide the information base needed to make effective management decisions to either rehabilitate and protect existing resources or develop new ones. In hard times and in the face of declining budgets, the federal/state/local partnership epitomized by Sea Grant is an effective way to make use of the intellectual brain trust available in New York. As I leave, I would like to thank all those who have supported Sea Grant's efforts throughout the years and encourage you to remain involved. Continued success of Sea Grant's mission will depend on individuals working with business and government towards a sustainable future. This issue is dedicated to the memory of Ruth Tompkins, whose dedication as Sea Grant's fiscal officer helped make everything we've done possible.

Dr. Anne McElroy

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Managing Shipwrecks in New York

by Judith N. Hogan

The wreck of the Mary Kay in Lake Ontario. Photo by Philip Church.

From a Revolutionary frigate off Montauk Point to North America's oldest intact warship in Lake George, New York waters are a haven for thousands of shipwrecks. These shipwrecks not only intrigue diving enthusiasts, but archaeologists and historians who view them as cultural artifacts that need to be preserved.

Up until a decade ago, there was little information about how many shipwrecks existed in state waters. Divers and treasure hunters scavenged the obscure shipwrecks with little regard for a law that prohibits the removal of artifacts. Their activities are viewed unfavorably by archaeologists and historic preservationists, who say valuable historic information is lost when 'souvenirs' are removed from shipwrecks. But in recent years, these opposing sides are more frequently teaming up to document and preserve shipwrecks in New York.

For avid scuba diver Dan Berg, the issue of shipwreck management isn't a matter of law, it's more a battle with Mother Nature. "All these wrecks are sinking in the sand, getting buried slowly over time," said Berg. "We want to find out and save artifacts from these wrecks before that burial process happens." The Long Island native has logged more than 2,000 dives on shipwrecks, and written 10 books on scuba-related activities (two that focus on the nearly 100 shipwrecks that he has found in the New York Bight).

The artifacts Berg discovers—china plates, cutlery, bottles, or pieces of stamped crate, to name a few—provide clues to a ship's identity. While his findings may represent the most complete record of shipwrecks on Long Island, museums will not accept his artifacts. And a recent change in laws regarding shipwrecks has made it the state's responsibility to resolve some disputes over ownership.

The Abandoned Shipwreck Act of 1987 transferred ownership of abandoned shipwrecks—shipwrecks without a legal owner—from the federal government to the states. Those shipwrecks found in submerged lands within three nautical miles offshore (except those owned by the military) are the property of the states. International vessels are protected under courtesy laws. In addition, colonial patents deeded sections of bay bottom and shore access directly to town governments, which can further complicate the issue of shipwreck ownership.

New York state laws make it illegal to remove artifacts from shipwrecks, but officials say the law is difficult to enforce. Without staff or money to manage shipwrecks, shipwreck preservationists have adopted an educational approach—working with state agencies and local diving groups on documenting and preserving shipwrecks throughout the state.

New York's first underwater preserves—museums for divers—were established in Lake George between 1993 and 1994. These preserves include the *Forward*, the *Sunken Fleet of 1758*, and the *Land Tortoise Radeau*. Managed by the State of New York with volunteer help from a community diving group, Bateaux Below, Inc., the preserves are open from Memorial Day to October. The *Radeau*, which sunk to 107-feet during the French and Indian War of 1758, is considered to be the oldest intact warship in North America. Divers must register and be assigned a time to tour the *Radeau*. A plastic chain around the wreck discourages divers from disturbing the site. The limited access has been respected by most divers, although two of the preserves were vandalized last summer.

The Lake George Heritage Preserve Program started when a local diving enthusiast and history buff discovered that some of the shipwrecks were being abused. "I decided it would be a good idea to train a group of divers and sensitize them to the preservation of shipwrecks," said Joseph Zarzynski, Bateaux Below's executive director. Bateau is a French word for a class of colonial vessels made out of pine and oak. The group chose the name since it symbolized their efforts in surveying the vessels of Lake George.

"Our goal in 1987 was to survey shipwrecks in Lake George and work toward nominating the historic vessels for the National Register of Historic Places," said Zarzynski. After they discovered the *Radeau* in 1990, they worked with Rhode Island archaeologist D.K. Abbass, on an archaeological survey of the 52-foot long warship. The Radeau was also named to the National Register of Historic Places in 1995.

The key to protecting wrecks is educating divers and the general public, Zarzynski said. "Artifacts on a shipwreck are an important part of the archaeological aspect of a wreck," he said. "When you start removing bits and pieces of it, like pieces off a painting - you are not getting the whole picture." Bateaux Below is currently taking an inventory of all the wrecks in Lake George, with hundreds still to be found, Zarzynski said.

The Lake George effort sparked other regional shipwreck initiatives, several supported by New York Sea Grant. With an estimated 160 shipwrecks in Lake Ontario, divers and underwater archaeologists in Oswego expressed the need for shipwreck educational programming and management plans. Sea Grant helped organize several awareness seminars training divers on proper shipwreck archaeological techniques.

An open cannon port on the Land Tortoise Radeau. Photo by Russ Bellico.

Some of the divers helped the Oswego Maritime Foundation survey the *David W. Mills*, a typical 19th century Great Lakes steam barge. With the help of trained, volunteer sportdivers, the Foundation also surveyed the wreck of the *Mary Kay*, a tugboat which sank in 1988. A half-hour documentary produced by the group about the *Mills* has aired on a local PBS affiliate, and another video focusing on shipwreck artifact preservation is being developed.

"The survival of the sport diving industry depends on the existence of attractive, artifact-filled dive sites," said Philip Church, director of the Foundation's Submerged Cultural Resource Program. "No one wants to buy expensive equipment and hire a dive

charter just to dive on an empty, barren hulk."

The Oswego program's success led to a similar baseline awareness program in the Niagara Falls area sponsored by New York Sea Grant and the Niagara Falls Aquarium with over 120 divers participating. A steering committee was organized to develop a series of public awareness programs on submerged resources. Another Sea Grant presentation for a St. Lawrence River environmental group, Save The River, prompted the formation of the St. Lawrence River Historical Association. The association is now conducting a survey of a potential 18th century warship.


Wreck of the Mary Kay. Photo by Philip Church.

Another threat to shipwrecks is the zebra mussel. While the zebra mussel has improved water clarity in the Great Lakes, enhancing visibility for divers, it also covers up the wrecks, obscuring their beauty, said David White, a New York Sea Grant Extension Specialist.

With more than 8,000 shipwrecks estimated to lie buried in the Great Lakes, concern about preserving these underwater resources has become a focus for Sea Grant and other agencies. Based on the shipwreck preservation efforts of Michigan Sea Grant, White helped bring state agencies together to create a management plan for shipwrecks that would accommodate both recreational divers and preservationists.

"The symposium ignited interaction on hot issues such as liability, access, and amnesty," White said. Officials of the five agencies, including the New York State Departments of Education, State, and Environmental Conservation, as well as Coastal Zone Management, the Office of Parks, Recreation and Historic Preservation, and the Office of General Services, shared perspectives on underwater resource management.

The group is working toward a Memorandum of Understanding that will allow divers to explore wrecks without destroying their historic value. "There are many important parts involved in shipwreck management—the environment, tourism, cultural and community interests," said Alan Bauder, Submerged Lands and Natural Resource Manager for the New York State Office of General Services. "We're working together to make sure everyone's interests are heard." The group is seeking input from local groups on this effort.

Efforts to preserve shipwrecks are also underway on eastern Long Island. A community group there is now developing plans for an underwater park at the site of the H.M.S. Colloden, which ran aground during the Revolutionary War in 1781, just west of Montauk harbor. The English frigate, which was salvaged and reburied, is the only Long Island shipwreck on the National Register of Historic Places. Municipalities are now planning an archaeological excavation of the wreck, and have nearly $2 million set aside to purchase waterfront property that will provide visitors easy access to the underwater preserve.


Wreck of the Mary Kay. Photo by Philip Church.

OVERCOMING PRESSURE

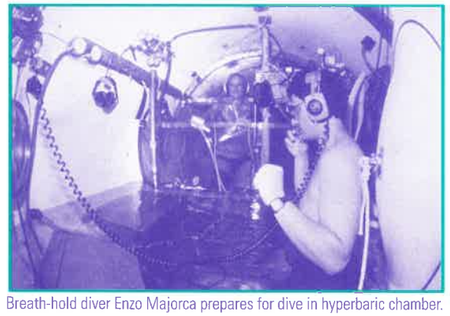
Physiologist Claes Lundgren Continues His Breakthroughs in Underwater Diving

by Julie Zeidner

Underwater diving causes unusual changes to occur within the human body. The body responds like those of seals and ducks during breath-holds under water, but to a less effective degree. When air intake stops, the heart slows and blood moves to protect the heart and brain. Yet even with a steady air supply provided by underwater diving gear, the human body is affected by pressures that leave marine animals untouched.

The research of Dr. Claes Lundgren, a prominent physiologist at the State University of New York (SUNY) at Buffalo, has led to refinements in underwater diving appartus still used by several navies of Europe, and medical discoveries that have helped people to understand the effects of extreme environments on the human body.

Attempts to construct underwater breathing apparatus go back several centuries, but it wasn't until 1943 when French naval engineers Jacques Cousteau and Emile Gagnan developed the first automatic compressed air Aqua-Lung that the sport of scuba really took off. But it was William Beebe, an American biologist who descended in a bathysphere to a record depth of 3,028 feet in Bermuda waters in 1934, who most inspired Lundgren.


Breath-hold diver Enzo Majorca prepares for dive in hyperbaric chamber.

SCUBA—the acronym for Self-Contained Underwater Breathing Apparatus—allows divers to breathe underwater by automatically delivering air on demand. Many of the diving injuries that occur are a result of breathing air under pressure. Air spaces in the body, including the sinuses, ears, and lungs, are affected by pressure changes under water. During descent, water pressure increases and pushes on the body's air spaces, compressing them. Upon ascent, these air spaces expand. Divers learn to breath continuously when rising to the surface so that the expanding air escapes during ascent and their lungs remain at their normal volume.

New York Sea Grant has funded numerous projects by Lundgren in an effort to enhance the safety and efficiency of scuba diving. "Although most of what we hear about scuba diving focuses on the recreational aspects, diving is also a very important professional industry. Among other things, it is used in marine resource exploration and husbandry, which are of particular concern for Sea Grant," said Lundgren. "But scuba can be fraught with dangers if not conducted in the right way; and even when conducted according to the 'book,' it sometimes leads to problems and injuries for reasons that we don't fully understand."

To help Lundgren take a look at the risks of going to extraordinary depths, he brought three world-class Italian divers to the SUNY Buffalo Center for Research in Special Environments (where Lundgren serves as director) in 1991. Enzo Majorca and his two daughters, Patrizia and Rosanna, are famous for their ability to dive up to 100 meters under water while holding their breath. While they were submerged under water, catheters inserted into the divers' arms allowed Lundgren's team to measure the way the body acts to protect the heart and brain, which are always in need of a continuous oxygen supply to survive.

"What we observed was absolutely astonishing," Lundgren recalls. "We were actually able to witness the dive reflex, which extends one's ability to stay under water. Just like whales, all land-living creatures from chickens to humans have a dive reflex in water that causes a tremendous

slowing of the heart rate. As the body gets wet and cold, blood vessels in the muscles and skin contract so that very little blood flows to the periphery."

Lundgren's experiments with the Majorcas also confirmed theories about the inherent danger associated with immersion in cold water and diving that can cause sudden death. Cold water elicits a more prominent dive response and slowing of the heart, so Lundgren assumed people could hold their breath under water longer in these conditions. This is not the case. In lab tests, Lundgren and his graduate student, John Sterba, found that individuals' breath-holding capacity was much greater in 95-degree water. "The simple explanation is that humans are not tolerant of cold water," he said. "They start to shiver, use more oxygen and produce more carbon dioxide, and can't hold their breath as long." New studies by Lundgren and his researcher, Lu-Peng Chang, reveal that changes in the blood circulation occur when humans are immersed in thermoneutral water, where water temperature is kept at normal body temperature, creating a larger storage capacity in the tissues for carbon dioxide, so that the urgency to breathe is not as pronounced. By learning more about how the body responds during diving and swimming, Lundgren hopes to be able to counteract these physiological responses to help people participate safely in these activities.

Understanding the potential dangers of nitrogen and pressure in divers continues to be another important focus of Lundgren's research. Nitrogen from each breath of air diffuses into the blood and then into the tissues during every dive, but unlike oxygen, nitrogen is not utilized, so it builds up. The amount of nitrogen absorbed by the body depends on how long and deep the dive is. When divers ascend and the surrounding pressure decreases, the nitrogen slowly diffuses back into the blood, and exits the body through exhalation. But if the diver is down for too long, and tries to surface too quickly, the excess nitrogen can form bubbles in the blood vessels and tissues during ascent. Like a soda bottle opened too fast, these bubbles in the blood cause the serious medical condition called decompression sickness (DCS) or "the bends." Even in casual recreational diving, DCS can occur, causing joint pain, mild tingling or numbness, weakness, and fatigue. In more serious cases, symptoms can include paralysis, shock, and difficulty breathing. Unconsciousness and death can result. Symptoms can occur up to 12 hours after the dive. Treatment for DCS involves repressurizing the afflicted diver in a recompression chamber.

But DCS can be avoided. Dive tables are used to gauge how much excess nitrogen divers have in their bodies, so they can determine their maximum safe dive time and depth limit. Lundgren and his team conducted studies analyzing these decompression tables to see if a simple mathematical relationship could be found between inhaling oxygen and expelling nitrogen. It was already known that breathing pure oxygen speeds up the elimination of nitrogen from the body. He discovered this formula is more difficult to calculate than previously assumed, because oxygen at high pressures constricts blood vessels and actually hampers the elimination of nitrogen from the body.

"Designing decompression tables for air or pure oxygen intake is more art than science," Lundgren said. "What impact this observation has on the design of decompression charts in the future remains to be seen."

A research team led by Gerald Logue and Lundgren is currently testing the idea that the body's immune system responds to nitrogen bubbles like that of a foreign invader to trigger the bends. "There is a strange phenomenon that often occurs," Lundgren said. "During exactly the same amount of time and depth, one diver will be affected by DCS and others untouched, or a diver will sometimes show symptoms and sometimes won't." Related to this observation is the question of whether with age, the immune system weakens and the chance of getting DCS increases. This research, Lundgren hopes, will help in the development of a test for divers to determine whether their immune systems are prone to DCS.

Another approach to reducing the risk of DCS is to enhance nitrogen elimination with the use of medical substances. A recently completed Sea Grant study by Lundgren and other researchers has identified several drugs that hold promise in this regard.

Partly drawn to underwater diving because of its uncertainties, Lundgren is now trying to minimize the danger of the activity. "There is a thrill factor in some sports that I suppose is part of the attraction—hang-gliding is an example," the physiologist said. "But you have to do it right not to run into trouble. Part of mastering a skill is knowing how to do it right, and following certain rules."

(A related article appeared in Nor'Easter, Volume 6. Number 1)

Fisheries

Saving Sturgeon: Molecular Studies Aid Rehabilitation

by Julie Zeidner

This 100-lb. female sturgeon will be radiotagged by researchers so they can track her movements.
Photo by John Waldman.

Sturgeon are remarkable.

Prehistoric creatures that look like a cross between a dolphin and a dinosaur, they can grow to more than twelve feet and weigh more than 800 pounds. Descended from a group of animals called chondrosteans (which predate the dinosaur) sturgeon (*Acipenseridae*) have roamed our rivers and seas for millions of years.

Gentle fish that feed on bivalves and worms, the sturgeon might have originated in Western Asia and are presently found throughout the Northern Hemisphere. Adaptive fish that live in lakes, rivers, and seas, sturgeon are nonetheless in deep trouble. Only two dozen species of sturgeon survive. Prized for their eggs (a four-ounce tin of caviar from the Beluga sturgeon sells for $275) as well as its meat, sturgeon have been heavily overfished throughout the world. Pollution and dams have further encroached on their habitats, threatening the remaining species.

Concern over the decline of the sturgeon has afforded it status under the federal Endangered Species Act, and most states along the East Coast have placed fishing moratoriums on sturgeon. In March, emergency regulations were published closing the recreational and commercial fishery for Atlantic sturgeon (*Acipenser oxyrinchus*) in New York altogether. But until recently, very little was known about the life history of these fish or how they varied. Any effort to restock this commercially important fish would depend on reliable information about them.

That's where Sea Grant researchers Isaac Wirgin and John Waldman come in. In the largest genetic study of any sturgeon species ever done, Wirgin and Waldman are solving some of the mysteries associated with these distinct stocks in research that could help pave the way for the recovery of the Atlantic sturgeon in North America. Wirgin is an associate professor of environmental medicine at New York University Medical Center, Waldman a research associate at the Hudson River Foundation.

"Since the turn of the century, all populations of sturgeon along the Atlantic and Gulf Coast have been depleted," Wirgin said, "and some sturgeon populations—once abundant in places like Chesapeake Bay—are thought to be extirpated." The sturgeon's decline is a loss on several counts, researchers said. Not only do they play an important role in the benthic food chain, but they are one of our last vertebrate connections to the days of the dinosaurs.

The Atlantic sturgeon extends from Labrador to the Gulf of Mexico. Historically, there were fisheries in most of the major river systems in the species range. Along the Gulf Coast, sturgeon populations once extended from Tampa Bay all the way to the Mississippi River.

Atlantic and Gulf sturgeon are considered two separate subspecies, and conservation measures differ for each. Gulf sturgeon (*Acipenser oxyrinchus desotoi)* live in a very marginal habitat. They survive in cold water refuges, pretty much starving all summer. During a three-month period, they travel into the Gulf of Mexico where they feed heavily in colder water.

In contrast, when the Atlantic subspecies (*Acipenser oxyrinchus oxyrinchus*) are old enough to enter the sea at approximately age two, they might spend 10 years or more there before they return to their birthplaces in rivers along the Eastern Seaboard to spawn. The only physical characteristic that differentiates the two subspecies—considered to be diagnostic—is relative spleen length.

Based on these very different life history strategies and a physical difference, Atlantic and Gulf sturgeon were assigned subspecies status, but until now researchers suspected there was no genetic evidence to support the division. When Gulf sturgeon were officially listed as a threatened species in the 1990s and a plan was issued for their recovery, it became important to know whether their subspecies designation was warranted.

That was one of several questions that sent Wirgin and Waldman off on an intensive four-year study, examining genetic mitochondrial DNA differences between and among Atlantic and Gulf sturgeon. Their work, funded by New York Sea Grant, the U.S. Fish and Wildlife Service, and the Gulf States Marine Fisheries Commission, could pave the way for the safe introduction of hatchery-reared Atlantic sturgeon back into the wild.

With a sturgeon's fin clip, barbel or blood sample, they were able to analyze DNA makeup, comparing Gulf sturgeon specimens from eight drainages extending from the Mississippi River to the Swanee River with samples from Atlantic sturgeon.

Not only did Wirgin and Waldman find strong genetic differences between Atlantic and Gulf Coast sturgeon stocks that justified the subspecies designation, they encountered strong regional distinctions in sturgeon taken from different rivers in the Gulf even when the river mouths were relatively close. Researchers now theorize that Gulf sturgeon stocks could have diverged genetically from Atlantic sturgeon stocks during the Ice Age when the rounded lobe of Florida was formed, creating a barrier that isolated Gulf sturgeon from their relatives.

In the case of the Gulf sturgeon there has been a lot of interest in restocking rivers with sturgeon from elsewhere, if it could be shown that there were no genetic differences, Waldman said. Part of the sturgeon management plan is to restore all populations to levels that would support some commercial fishing in the future. To accomplish this goal, it was envisioned that hatcheries would be established to produce fish to support natural production. But could fish from another part of the Gulf region be used to restore all other populations there?

Sturgeon fishing along the Hudson River in the 1800s.

Establishing significant genetic differences in Gulf sturgeon—down to five regional or river-specific stocks—told researchers something.

"You can't take a Choctawhatchee fish and justify putting it in the Pascagoula," said Waldman—advice he has passed along to fishery managers considering efforts to improve sturgeon stocks.

"It's a whole lot easier if these fish are the same," Waldman said. "If there are differences, then you really are contaminating the genetics." Waldman noted that efforts to introduce striped bass from the Atlantic Coast into the Gulf region had been a mistake. Transplanted fish did not have the genetic compostion of native striped bass, and by interbreeding with natural populations of striped bass, could have compromised their offspring's ability to respond to environmental factors. Fishery managers are leery of making the same mistake with sturgeon, he said.

Atlantic sturgeon are listed as "species of special concern" under the U.S. Endangered Species Act, one step below the "threatened" status assigned to Gulf sturgeon. Unlike their Gulf Coast relatives, Atlantic sturgeon stretch across a wide range of latitude from Canada to Florida. Historically, the Chesapeake Bay and Delaware River had the largest populations of sturgeon, but heavy pollution and overfishing is thought to have led to their extinction in the Chesapeake and to a relict stock in the Delaware River. The Hudson River now has the largest population of sturgeon on the East Coast and was fished heavily until this year's moratorium. Meanwhile, the incidental catch of sturgeon in shad fishing nets dropped from hundreds per season to single numbers in a matter of a decade.

"It was obvious that adult sturgeons were being heavily harvested in the river," Waldman said, "and the young fish were not following behind. A collapse was staring us in the face."

In the late '80s, a targeted fishery of more than 200,000 pounds of sturgeon per year had developed in the New York Bight off the New Jersey coast, and off the south shore of Long Island. Fishermen along the Hudson River also learned how to process their own caviar from sturgeon and make substantial profits on that—up to $3,000 for one large female sturgeon.

Before a recovery plan for sturgeon could be developed, there was a need to document whether it was Hudson River sturgeon being caught in the New York Bight. Prior to this study, there was little information about how far Atlantic sturgeon traveled outside of their natal rivers. Fishermen had caught Atlantic sturgeon as far away as Venezuela. Could sturgeon from the New York Bight be from distant stocks, such as the Edisto River in South Carolina?

Genetics was one way of finding out. In an effort to better understand the stock structure of Atlantic sturgeon and how they are subdivided along the Eastern Seaboard, Wirgin and Waldman characterized the genetic structure of these populations. The researchers found only three distinct regional stocks of Atlantic sturgeon, stocks from Canada and the southeastern United States as well as New York.

In Delaware, sturgeon have been captured recently that appear to be either a genetic mixture of Hudson River and southeastern stocks, or a mixture of Hudson River stocks and relict Delaware stocks. Before sturgeon can be restocked there, this issue remains to be studied, Wirgin said.

The Hudson River accounts for an astonishing 97 to 99 percent of the Atlantic sturgeon population in the New York Bight, the researchers discovered, only underscoring the urgency of protecting the Hudson River Atlantic sturgeon population since it is the only remaining viable population in the mid-Atlantic.

"The most likely story is that 300 years ago you might have had a much lesser Hudson River contribution," Waldman

said. "But given what has happened to these stocks from overfishing, pollution, and damming of rivers cutting off spawning grounds, they're all Hudson River fish today."

A moratorium on the recreational and commercial fishery for Atlantic sturgeon in New York will take the pressure off this species, and allow the populations to rebuild, said Byron Young, a marine resources specialist with the New York State Department of Environmental Conservation. "We have serious concerns about the well being of the Atlantic sturgeon, not only in New York, but up and down the East Coast," he said. "The research is showing us that Atlantic sturgeon are on the decline and we have the responsibility to stem that decline."

Another surprising outcome of the research was proof of the sturgeon's incredibly acute homing fidelity. Genetic analyses indicate only less than one percent of Gulf sturgeon stray from their birthplace. "These fish know where their home is and go back there," Waldman said.

Atlantic sturgeon showed higher mixing of spawners among stocks than their Gulf Coast relatives. Being away from the river for much greater periods of time may have led to higher straying rates, researchers hypothesize.

Sturgeon mature very late in life. Before they were overfished, some lived into their 60s. In the Gulf, sturgeon are 10 years old, and in the St. Lawrence River, 25 years old, before they're old enough to spawn. Moreover, Atlantic sturgeon don't spawn every year.

"It takes a long time for sturgeon to spawn and propagate so the rebuilding time is endless as compared to other fish," Waldman said. "Many sturgeon stocks that were overfished at the turn of the century, that have been pretty much left alone, have never come back."

Just reaching 10 percent of the original landings of Atlantic sturgeon on the East Coast is a goal for fisheries managers here, but research indicates, they're nowhere close. Moratoriums on sturgeon fishing could help even if it hurts in the short term.

"One has to conserve," Waldman said, "in order to have."

The Mighty Bluefish

by Judith Hogan

Ferocious whether fighting a hook or chasing prey, there's little mystery about why anglers love bluefish.

Bluefishing accounts for nearly $250 million of the total $1.48 billion in marine recreational retail sales for the mid-Atlantic region. Yet, for decades, no one really knew much about the bluefish—its migration and spawning patterns or life history. Two New York Sea Grant-funded scientists at the Marine Research Sciences Center (MSRC) at the State University of New York at Stony Brook are solving some of those mysteries about bluefish. Their work could play a pivotal role in improved management of this valuable recreational fishery.

In the 1970s, researchers at the National Marine Fisheries Service (NMFS) Sandy Hook Laboratory studying bluefish larvae and distribution of eggs, hypothesized that bluefish spawn twice a year on or near the edge of the continental shelf. They believed that larval development occurred near the water's surface and that young bluefish were dispersed by prevailing currents and, perhaps, active migration. Professor David Conover, a MSRC professor of fish ecology, tested this theory by monitoring the timing of recruitment of young bluefish into the New York Bight, to establish birth-date information.

This initial project confirmed the earlier hypothesis about bluefish spawning patterns, but provoked new questions regarding early-life mortality factors and the effects of larval transport on bluefish recruitment. Conover and Robert Cowen, a MSRC associate professor of fish ecology, thought that a better understanding of the fish's early life history would be beneficial to fishery managers.

Bluefish photo courtesy of Mark Malchoff.

Their first two-year project was one of six bluefish projects supported by New York Sea Grant. Since the level of recruitment determines year-class strength, knowing recruitment levels can allow managers to predict fish numbers in a given year. Initial findings suggested that spring-spawned bluefish are transported northward over a two-month period before they arrive as juveniles in inshore waters. It also indicated that spring appeared to be more successful than summer in spawning recruitment numbers.

From that point, the researchers took different paths. While Conover focused on the relative success of the spring and summer spawning events and their respective contributions to the adult population, Cowen studied larval transport patterns.

Conover's studies showed that bluefish grow rapidly feasting on local fish larvae, which could have a negative impact on other important fisheries. He focused on the Hudson River estuary, studying the impact of bluefish predation on the young river herring, striped bass, and white perch. Initial findings indicate that the mortality of young striped bass can be attributed largely to bluefish predation.

The Mid-Atlantic Fishery Management Council is collecting the researchers' data to use in future management decisions. Information about bluefish recruitment dynamics and spawning behavior, as well as the mortality rate of juvenile bluefish, will be critical in determining how to manage bluefish stocks.

Chinook Salmon Stocking to Increase this Spring, but Can Lake Ontario's Great Fishing Last?

by Julie Zeidner

Lake Ontario has a world-class reputation for sportfishing. In recent years, anglers there have set world records by catching the largest chinook salmon in the Great Lakes and the largest coho salmon ever.

Over the next two to three years, anglers will have a chance to catch more chinook salmon in the lake because the New York Department of Environmental Conservation (DEC) is increasing the number stocked. But how will ecosystem changes effect sportfishing in the long-run? This is a question that scientists and fisheries managers still wonder about.

Sea Grant researchers Donald Stewart and Stephen Brandt documented changes in the Lake Ontario ecosystem between 1987 and 1992 that concerned fisheries managers. Stewart is an aquatic ecologist at the State University of New York's College of Environmental Science and Forestry, and Brandt is a fisheries ecologist with the Great Lakes Center at Buffalo State College.

Photo courtesy of Oswego County Department of Promotion and Tourism.

They used bioacoustic sonar devices to measure total biomass of prey in Lake Ontario. Their studies, including analyses in collaboration with staff at the National Biological Survey in Oswego, showed that forage fish were decreasing in size and number, and the alewife that were surviving were in poor condition. The abundance of stocked sportfish—dependent on prey fish for their survival—had led to intense pressure on alewife and smelt.

With Lake Ontario's $100 million fishery potentially at risk, the Lake Ontario Committee formed a technical task group co-chaired by Stewart and Mike Jones of the Ontario Ministry of Natural Resources to review the status of Lake Ontario's ecosystem and in particular, stocked salmon and trout populations.

Based on the report and extensive public input, fish stocking of chinook salmon and lake trout was reduced by 50 percent in response to concerns raised. In New York, DEC stocking of the trophy-species chinook was reduced from 2.7 million to one million, and lake trout stocking was reduced from one million to 500,000 after 1993. Target stocking of other sportfish less dependent on diets of alewife and smelt stayed about the same: 513,000 steelhead, 425,000 brown trout, 245,000 coho, 100,000 Atlantic salmon, and 100,000 rainbow trout.

Despite concerns that the forage base might collapse after the severe winter of 1994, Lake Ontario's alewife population managed to survive. Earlier this year, the DEC with help from New York Sea Grant reconvened a technical panel of scientists and fisheries managers that included Stewart and Brandt to review the current status of Lake Ontario's predator-prey dynamics. The panel found that despite the dip in the alewife population in 1994, the prey fish were more resilient than they had previously assumed—alewife posted a small increase in 1995, Stewart said.

Trout and salmon that showed signs of reduced growth linked to a decreased forage base in '94 were on the rebound the following year. However, the stocking target for Atlantic salmon was reduced from 200,000 to 100,000 this year, and shortfalls occurred in the hatchery inventories of lake trout, brown trout, and rainbow trout in both New York and Ontario hatcheries. The DEC will respond to these changes by increasing the number of stocked chinook salmon in Lake Ontario by 250,000 this month to balance the shortfall in the stocking of other species, said Robert Lange, Great Lakes supervisor for the DEC Bureau of Fisheries in Albany.

"This move will increase opportunities to catch salmon over the next few years," Stewart said, "but not increase overall predation on prey fishes."

Anglers were also reporting exceptional fishing conditions this spring. Boaters reported excellent harvest rates of 3.5 fish per boat trip, which was double the average of the preceding six years, according to the April 1996 DEC boat census.

But the long-term sustainability of the Lake Ontario sportfishery is an issue that still concerns scientists and fisheries managers. Bad weather and another dip in the alewife population could leave stocked sportfish—without enough food—more susceptible to disease. The diminished productivity of the lake— from zebra mussels filtering out essential nutrients to reduced phosphorus levels from sewage treatment plants—could further reduce growth and survival of stocked sportfish.

The potential expansion of blueback herring populations in Lake Ontario might also impact alewife, said David MacNeill, a New York Sea Grant fisheries specialist.

Weakfish Set Free could be on the Rebound

by Mark Malchoff

Marine recreational anglers enjoyed increased weakfish angling opportunities in the Peconics, and south shore estuaries of Long Island last year. While this fishery is minuscule compared to the one that peaked in the early 1970s, weakfish enthusiasts and managers took notice of the upswing. This seemed to be very good news for a popular species—also known as seatrout—that had sustained important commercial and recreational fisheries from Massachusetts to North Carolina for more than a century.

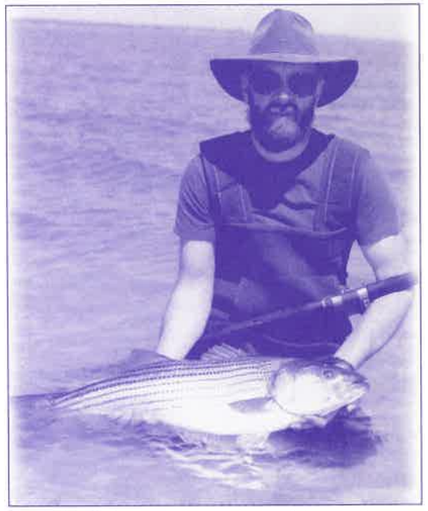
In 1985, the Atlantic States Marine Fisheries Commission developed and adopted the Fishery Management Plan for weakfish, one of 20 species of the drum family found along the U.S., Atlantic, and Gulf Coasts. Despite amendments to the plan in 1991, and again in 1994, the weakfish population has not rebounded. The commission will soon adopt a third amendment that should allow weakfish to recover to healthy levels capable of maintaining commercial and recreational harvests consistent with a self-sustaining stock. New York state regulations require that anglers throw back fish that fall under the 16-inch minimum size requirement.

The good news for anglers is that the fish they're releasing have a strong chance of surviving, and according to a new study, might be surviving at rates higher than previous estimates.

"Proper catch-and-release methods could help weakfish recovery," said Mark Malchoff, a New York Sea Grant Extension Specialist. The best available catch-and-release techniques include use of barbless hooks, quick retrieves, minimizing 'out of water' time, and the use of landing nets, wet gloves (if handling the fish), and other means to reduce injury to fish, Malchoff said.

To determine the short-term mortality rates of weakfish based on common release practices, Malchoff conducted research on weakfish (in the 12 to18-inch size range) using sport-angling tackle in Great South Bay during late August and September 1995. All angling was conducted from piers at the U.S. Coast Guard Station on Fire Island. The research team, including biologists from the New York State Department of Environmental Conservation and several volunteers, caught and tagged a total of 90 fish during four evening angling sessions. All of the weakfish were caught with single-barbed hooks (size 1/0) using either natural baits—squid strips or sandworms (*Nereis virens*)—or artificial baits—mostly plastic worms. The biologists recorded what kind of bait was used each time a weakfish was captured. Fish, retrieved without landing nets, were unhooked by hand or with the aid of hemostats.

Following capture, the individual fish were marked with anchor tags and placed in an aerated holding tank for a maximum of four hours. Although care was taken during the unhooking and processing, several animals were accidentally dropped onto the pier while being carried from where they were caught to the holding tank, Malchoff said. At the conclusion of each angling session, all weakfish caught were transferred from the holding tank to a mesh holding cage submerged in the bay for 72 hours to determine how many of them would survive. After the holding period, weakfish were measured and enumerated—whether dead or alive.



Mark Malchoff releases another popular sportfish–striped bass.

Researchers found that the short-term hooking mortality during the four trials was very low—ranging from zero to less than seven percent—with an average mortality of 2.6 percent, Malchoff said. Mortality also did not differ significantly between those fish caught on natural bait verus those caught on artificial baits.

The research results could be important for both anglers, biologists, and fisheries managers who want to conserve weakfish. "Anglers should feel confident that most of the weakfish they return to the water will live long enough to either spawn or be caught again," Malchoff said.

The study also demonstrates that angled weakfish—most of which fall below New York's 16-inch minimum size requirement—have a good chance of survival. Fisheries managers can use this information to revise their mortality calculations and possession limits necessary for recovery of the stock. The weakfish management plan about to be amended, which includes a 20 percent catch-and-release mortality rate estimate for weakfish, might be "unnecessarily conservative," Malchoff said.

For a copy of Guidelines to Increase Survival of Released Sportfish, contact New York Sea Grant, 3059 Sound Avenue, Riverhead, NY 11901.

The Cormorant Paradox — Bane or Blessing?

by Pat MacNeill

Large, dark birds that fly in flocks just inches above the water are now a common sight in Lake Ontario. The double-crested cormorant is a greenish-black waterbird named for the two small tufts of feathers on either side of its head.

During the 1950s and 1960s, cormorant populations were dramatically reduced when their reproductive capabilities were impaired by high levels of toxic pollutants.The success of water quality restoration efforts in the Great Lakes has led to a rebound in cormorants.

These birds—voracious feeders and gregarious nesters that form large colonies—are perceived as a threat to fishermen. Anglers are concerned that cormorants not only feed on major sportfish like lake trout and salmon, but compete with these large predatory fish for food. Cormorants also damage vegetation and may cause erosion in their nesting areas.

Diet studies conducted in the Great Lakes have shown that cormorants feed on small, non-commercial fish, and that less than two percent of the cormorant's diet includes sportfish. However, evidence is mounting that yellow perch—another popular Lake Ontario sportfish — is now becoming the dominant prey of cormorants in Lake Ontario. The issue of whether the birds are damaging the areas they use for nesting is an unresolved one.

On the bright side, cormorants can be thought of as one indicator of decreased toxic chemicals in Lake Ontario. When contaminants in the lake declined, cormorant populations dramatically increased. Scientists also gage the level of contaminants in the lake by the number of cormorant bill malformations. When chemical pollutants were reduced in Lake Ontario in the 1980s, bill malformations in cormorants also decreased.

"In a sense, to fishermen the proliferation of cormorants in the Great Lakes is an encouraging sign of improving ecosystem quality — the direct result of effective environmental quality management," said Sea Grant Extension Specialist David MacNeill. "The other side of the coin is that anglers have some legitimate concerns as to how cormorant feeding behavior may be affecting fish populations."

Although the cormorant populations have increased dramatically, experts predict this growth cannot be sustained forever. In recent years, their growth has slowed and even declined on Little Galoo Island, the largest colony of cormorants on the Great Lakes.

"This recent decline may be attributed in part to farther offshore and deeper movements of prey fish," MacNeill said. "Particularly the alewife, which could be responding to the increased light penetration in the lake from zebra mussel activity."

In response to concerns about cormorants, especially in the northeastern portion of Lake Ontario, Sea Grant sponsored an educational forum on the issue for anglers, conservation groups, and birding organizations. MacNeill also produced a report that summarized the results of a two-year U.S. Fish and Wildlife Service (USFWS) cormorant diet study. He was appointed as a technical advisor and helped organize a cormorant task force with the New York State Bureau of Wildlife, the USFWS, and a group of concerned stakeholders. The consensus of the cormorant task force was that some measure of cormorant control should be initiated in New York. They acknowleged that cormorants are a rightful part of the ecosystem, but recommended control measures to reduce the threat to fisheries, and to restrict additional colonization.

Nesting cormorants. Courtesy NYDEC.

Promoting
Lake Ontario's Sportfishery

by Diane Kuehn

Each year thousands of anglers travel to New York's Lake Ontario Region to enjoy the fantastic salmon and trout fishing of the lake and its tributaries, as well as the incredible bass fishing of the lake's many bays. Tourism-related businesses such as charter boat operations and marinas along the coast depend on the lake's sportfishery for their survival. Since 1990, declines in travel nationwide, as well as concern by anglers over contaminants in Lake Ontario fish and changes in Lake Ontario fish stocking and regulations, have contributed to a decline in the number of anglers traveling to Lake Ontario, affecting these coastal businesses.

"The lack of a coordinated promotional effort for Lake Ontario as a whole," said Diane Kuehn, a New York Sea Grant Extension Specialist, "added to these problems. The counties along the Lake Ontario shoreline needed to work together to promote the region."

In November 1993, the NYS Department of Environmental Conservation, NYS Department of Economic Development's Tourism Division (now called the Empire State Development Corporation), and New York Sea Grant organized a meeting for representatives of the Lake Ontario Region Tourism Promotion Agency (TPA) and chamber of commerces from the seven counties bordering the lake. The meeting provided a forum for discussing concerns about promoting the lake's sportfishery. Through this and subsequent meetings, the group recognized the need to work together to attract anglers to the lake, and decided to form the Lake Ontario Sportfishing Promotion Council (LOSPC).


Salmon fishing. Photo by Philip Church.

A Sea Grant publication, "Forming a tourism or recreation association in New York state," written by Kuehn, was used by the group as it applied for incorporation status in 1994. Kuehn acted as temporary secretary for the group until its incorporation became final in 1995. Douglas Ververs, a Cornell Cooperative Extension of Oswego County Agent under contract with New York Sea Grant, assisted the group with writing its bylaws.

Working together, the group has accomplished significant results on an extremely limited budget. Ten thousand copies of two promotional brochures were produced and distributed at sportfishing trade shows throughout the northeast in 1995 and 1996. A marketing and promotion strategy plan for LOSPC's activities was also produced. As many as 30,000 anglers attending trade shows this spring received a tip sheet which included information on the large number of fish stocked in Lake Ontario, proper methods for cleaning and cooking fish to reduce contaminant levels, and tips on clear-water fishing techniques. The tip sheet is being produced quarterly for the council by Kuehn, and distributed to sportfishing-related businesses throughout the region by council members. To counter negative press about the Lake's sportfishery, numerous press releases are mailed out on a regular basis by council members, including New York Sea Grant. Through contributions from each TPA, the council produced a six-page cooperative advertisement on sportfishing on the lake in *Journey*, the promotional magazine of the Seaway Trail (a scenic byway in the region). LOSPC members are also working together to coordinate five fishing derbies along the Lake in 1996.

State legislators have also recognized the importance of the council's efforts. One state senator requested a $500,000 line item in the 1994 New York State budget for the effort. The line item was unfortunately not funded. Staff members of several state legislators frequently attend LOSPC meetings.

The council is currently applying for a state grant to establish an office responsible for organizing council-sponsored fishing derbies in the future. This will make it easier for anglers to obtain derby and regional tourism information in the future. The council also plans to continue producing tip sheets, news releases, and brochures designed to lure anglers to Lake Ontario.

New Opportunities
for the Charter Boat Industry

by Judith N. Hogan

Overfishing, a downturn in the regional economy, increasing regulatory mandates, and seafood consumption advisories are the top problems confronting New York charter fishing operators.

- Since angler expenditures on Long Island were estimated as high as $71 million in 1989, protecting the recreational fishery is all the more critical. But charter boats are catching less fish, carrying less passengers, and watching their expenses increase, said Mark Malchoff, a New York Sea Grant Extension Specialist. The industry is still rebounding from misconceptions about contaminated seafood and floating debris that caused a panic in the mid-'80s. Chartering businesses are responding to the loss of the customer base by offering half-day and evening cruise trips, as well as catered affairs to offset increasing operating costs.
- To provide members of the sportfishing industry with up-to-date fisheries management news and small business information, Malchoff produces the *Commercial Vessel Passenger News*. He also serves on the East End Charter Boats Committee, and helped design a new brochure promoting party and charterboat fishing.
- In the Great Lakes, charter operators are confronting similar problems. While Lake Ontario is one of the most productive freshwater fisheries in the world, an unstable forage base and the potential threat of hatchery diseases jeopardizes the fishery.
- Fisheries managers have responded to changes in the forage base by reducing the number of stocked sportfish in the lake.
- While the Great Lakes charter industry experienced substantial growth in the past 20 years, a recent New York Sea Grant study by Chad Dawson, associate professor of recreation and tourism in the SUNY College of Environmental Forestry, showed a 29 percent drop in the number of charter businesses there since 1990. To assist sportfishery stakeholders, New York Sea Grant Extension Specialist David MacNeill produces a publication, *Charterlines*. Six annual "State of the Lake" seminars organized by Sea Grant provide anglers with the latest university-based fisheries information. Charterboat owners and operators are trying to increase customer base by developing diversified businesses with information they've received at Sea Grant workshops.

Photo courtesy Wayne County Dept. of Promotion and Tourism.

Helping Native Americans Restore a Way of Life

by Pat MacNeill

New York has a large and diverse Native American population that lives on and off 10 reservations throughout the state. Native American communities—six along the coastline—are confronted by a range of environmental problems including toxic dumping, sewage disposal, petroleum tank leakage, and agricultural runoff, which not only contaminate ground and surface waters, but threaten a traditional way of life.

For the Akwesasne Mohawks who live along the St. Lawrence River, fish used to be a major part of their diet until the St. Lawrence Seaway dam was built in the 1950s. Dredging and factory pollution — there are four superfund sites in the area — have contaminated water and harmed marine life.

"We used to have a fish box outside our door," said Tom Porter, a chief from the Akewesasne reservation straddling the St. Lawrence River. "We caught our fish with nets and kept the fish in this box. When friends or family came, we shared the catch with them." When fish became contaminated, Mohawks turned to American style fast food and fattier diets.

Helping Native American communities restore land and water quality, as well as a healthy fish supply has been a focus for New York Sea Grant since the early 1970s. From the south shore of Long Island to the St. Lawrence River in upstate New York, New York Sea Grant has worked with Native Americans on aquaculture projects, wetland restoration, science education, and environmental workplans.

Tending to fish in the Akwesasne pen culture along the St. Lawrence River. Photo by Dave Greene.

Sea Grant researcher Joseph Buttner recently worked with members of the Akwesasne Task Force on the Environment (ATFE) to determine whether contaminant-free fish could be raised in a pen culture in the St. Lawrence River. The Native American environmental organization was formed to bring fishing back to the area, said Dave Arquette, an ATFE member. The task force, asked Buttner, an assistant professor of biological sciences at SUNY Brockport, to help them investigate the aquaculture project. Buttner's research indicated that fish isolated in pens from contaminated bottom sediments met Food and Drug Administration guidelines for human consumption. The aquaculture project also provided the community with income potential and employment opportunities.

To help children understand the importance of a healthy and abundant fish supply, the task force also set up an indoor aquaculture display in a local school. "We want to spark their interest," Arquette said, "so they can carry on the work of increasing the availability of clean fish for our community."

The Mohawks also built a demonstration fish hatchery in the Akwesasne region this past winter, with advice from Buttner. "We have a few million yellow perch eggs that will be ready to hatch at the end of May," said Lloyd Benedict, director of Ekohawk, another Native American environmental organization. And while it is still only a demonstration project, the Mohawks eventually hope to produce 20,000 perch per year for them population to raise, eat and sell, Benedict said.

The Native American community also hopes to raise sturgeon in the future. Sturgeon, prized for their meat and eggs (see page 7), are only found in waters downstream of Montreal because St. Lawrence Seaway dams obstruct upstream migration. Reintroducing hatchery-reared sturgeon to the upper waters of the St. Lawrence River might be another way to return these fish to their former home. Sea Grant, working with the Mohawks of Akwesasne, are planning a sturgeon workshop this fall bringing researchers together with tribal members to provide a better understanding of the sturgeon resource.

Working with Native Americans communities on coastal resource conservation and development issues is an important focus for Sea Grant Extension Specialist David Greene. "The Native American Land Initiative," a partnership between Native Americans and staff from New York's Sea and Land Grant Colleges, was initiated in 1993. Greene helped organize an advisory committee with representatives from Native American communities across the state, to help identify needs related to resource protection and use.

Habitat restoration, economic development, and environmental education efforts organized by Greene are important components of the Native American Lands Initiative. An ongoing project for Sea Grant is helping the Mohawk community protect black ash and sweetgrass, plants used in Native basketmaking and ceremonies that can also be used to restore wetlands. Reservations have agreed to establish nursery plots, and exchange information about their restoration efforts, Greene said. To learn more about the tourism and hospitality business, more than 125 Seneca Nation employees participated in a hospitality training workshop organized by Nation-owned retail and service enterprises.

On Long Island similar efforts are underway. A Shinnecock Nation tribal member Keith Phillips, trained by the Cornell Laboratory for Environmental Applications of Remote Sensing (CLEARS), is conducting a natural resource inventory on the 800-acre reservation on the south shore of Long Island. With Sea Grant support, a Cornell undergraduate, Tamara Saltman assisted employees of a water quality lab on the Akwesasne reservation, and extended science outreach to Native American youth there.

For his work with Native Americans, Greene received the Northeast Directors Cooperative Extension Award of Excellence.

The Public Pitches In to Clean Up the Sound

by Judith N. Hogan

On boats and beaches, in classrooms and communities, people are learning about how to be stewards.

Touring the Sound by boat, government officials from New York and Connecticut will be briefed this summer and fall on the various environmental problems plaguing the estuary. Nearly two dozen children—some of whom might never have walked on a beach or been on a boat before—are now exploring the habitats of the Sound from these vantage points.

■ Protecting Long Island Sound's water quality is an effort that teachers and students are also applying in their communities. Science teachers are incorporating water quality monitoring techniques into their classroom curriculums, and taking their students to the Sound to conduct site work. Fourth graders are learning how one small creek in their hometown, and what they do in their own homes, impacts the water quality and marine life of the Sound. A group of high school students is helping their community learn about environmentally-sound lawn care techniques that do not harm local waterways.

■ All these initiatives, being conducted around the Sound by different groups, have one thing in common—they've received support and funding from the Long Island Sound Study's (LISS) Public Outreach and Education Small Grants Program. Started in 1985, the Study's purpose was to research, monitor, and assess the water quality of the 110-mile long estuary, with funding from the U.S. Environmental Protection Agency (EPA) and the states of Connecticut and New York. In 1994, the study issued a final Comprehensive Conservation and Management Plan, a blueprint that outlines actions to improve water quality, protect habitat and living resources, educate and involve the public, monitor progress, and redirect management efforts to improve the long-term health of the Sound.

Children from the Port Chester-Ryebrook YMCA. Courtesy of SoundWaters.

■ The $25,000 grants program is geared toward motivating people to help restore the Sound. Innovative local projects will increase public support and understanding of Long Island Sound, said Kimberly Zimmer, a New York Sea Grant program assistant and LISS New York outreach coordinator.

■ "The response was great," said Zimmer, who serves as grants coordinator. The review committee received 35 proposals and selected six projects. The LISS Public Outreach Workgroup is currently working on a second project call this spring, and hopes to award an additional $25,000 by the fall.

■ "This is very exciting because people have really taken an interest," Zimmer said. "We're getting the word out, and the projects are involving different facets of the community" including educators, students, children, and county planning departments, as well as different community groups in both New York and Connecticut.

Sound Waters, a Connecticut-based organization whose goal is to preserve the Sound through education, describes the grant project as a "truly great program." The group worked with the Portchester-Ryebrook YMCA after school program to teach children between the ages of eight and 10 years old about Long Island Sound.

■ "These programs are making a difference," said SoundWaters Executive Director Ruthann Shapiro. "It's very exciting to see some of our original kids become stars in our middle school watershed project. Hopefully these students will then become high school mentors, completing the circle."

A Beautiful Garden That Saves Time and Money

Cornell Cooperative Extension Specialist Richard Wier explains sound gardening principles to Master Gardeners at the Oyster Bay demonstration garden.

by Julie Zeidner

It's summer and it's time for gardening. People are outside mowing their lawns, tending to vegetable gardens, planting trees, clipping bushes, and watering the grass.

• Few homeowners would argue against having gardens that attract butterflies and birds, protect local waterways, as well as save time and money. Residents from across Long Island Sound, the Hudson River Valley, and Great Lakes are proving that such handsome gardens can be achieved.

• The "Sound Gardening" trend started clear across the country where residents caught on to a Washington State Cooperative Extension Program. A series of popular fact sheets about environmentally sound gardening provided tips to residents on how to protect the water quality of Puget Sound.

• "Homeowners use many of the same materials as farmers including fertilizers and pesticides," said New York Sea Grant Extension Specialist Robert Kent. "And like farmers, they irrigate their property. These horticultural problems have the potential to contribute to water quality problems."

• Across the United States, Cooperative Extension is helping farmers learn how to protect the environment through programs such as Integrated Pest Managment.

• "However, few programs exist to teach homeowners how to be good stewards of their property," Kent said. As a marine educator, he advises residents on environmentally friendly practices that could help protect water quality in Long Island Sound.

• He brought the Sound Gardening program to New York, and with the assistance of other Sea Grant extension specialists, developed gardening fact sheets that are now used throughout the state. The fact sheets provide such tips as the safe use of pesticides, watering techniques to diminish soil erosion, and plants best suited for the environment. Any homeowner on Long Island who adopts at least five new sound gardening practices receives a certificate in recognition of their achievement.

• "A lot of plants we use are from all over the world," Kent said. "But they may not be adapted to our local environment. They may require extra watering, extra fertilizing, and sprays to control pests."

• In an environmentally sound garden, flowering shrubs and woody groundcovers—hibiscus, hydrangea, and yucca, to name a few— require less upkeep. They're better for the environment because less fertilizers, pesticides, and irrigation are required, products that can wash into and pollute our waterways. Sound gardening also encourages composting to reduce waste stream from the garden.

• With the help of Master Gardeners—volunteers trained through the National Cooperative Extension Program—Sea Grant has started to demonstrate these principles in real life, Kent said. At garden clubs and civic organizations, Master Gardeners and Sea Grant staff are now giving slide talks on environmentally sound gardening techniques that homeowners can practice. A sound gardening demonstration site in Oyster Bay established by Master Gardeners will be open for tours next summer. And New York Sea Grant has plans for another site in the Hudson River Valley this year.

• In western New York, Sea Grant Extension Specialist Jennifer Pultz is taking Master Gardeners to neighborhoods to show residents how to care for their landscapes using environmentally friendly practices.

• "The real challenge," Pultz said, "is reaching the people who are not interested in water quality, but are interesting in having a good looking lawn." Her program, called Homescape for Water Quality, was modeled after a successful program used by Cooperative Extension in rapidly developing Prince William County where runoff from residential lawns, gardens, and septic systems is harming waterbodies like the Chesapeake Bay. The project, funded by the New York State Department of Environmental Conservation, started in November, 1994. Fifteen volunteers willing to donate 50 hours of time were trained by Pultz in Master Gardening techniques. Residents of Orchard Park, a 60-home development on a six-acre lake, were the first to sign up for the program.

• "Many homeowners were thrilled to have their own private consultant," said Pultz. Master Gardeners worked with individual Orchard Park homeowners on taking soil tests and completing a pre-survey of their current lawn care practices. None of the 30 homeowners who signed up for the program indicated that they had ever had the pH-balance in their soil tested to determine whether their grass was absorbing all the nutrients it needs to stay healthy. During the year, the Master Gardeners helped them track their use of water, fertilizer, pesticides, seed, lime, and other lawn care practices. Pultz used these indicators to track the success of the program. At several workshops hosted by Sea Grant, residents learned about organic lawn care, pruning, and fertilizer use.

• As an added incentive to encourage Orchard Park homeowners to plant native vegetation including maple, white pines, myrtle, and day lillies rather than turf, Pultz and the Master Gardeners designed a garden in the common area of the development.

Photo by Ian Stupakoff.

• "The garden also solved another problem" Pultz said. "Geese!" The Homescape garden with its button bushes and lillies discouraged geese from walking up onto the common-ground property. Other homeowners saw the benefit and began to plant similar vegetation along their shorelines to prevent geese from wandering onto their properties.

• After participating for just one year, Orchard Park resident John Todoroff calculated that he saved $250 by participating in the Homescape Program. Eighteen of the 30 residents who signed up completed the program. To honor their achievement, Pultz gave them recognition stones etched with the words "Homescaped for Water Quality." Mr. Todoroff created a garden bed on his front lawn with the etched stone as a focal point.

• Homescape for Water Quality has caught on. Residents of Windmill Estates near Lake Erie are now participating in the program. This is very gratifying for Pultz.

• "Residents can achieve a beautiful lawn," she said, "that benefits water quality, the environment—and perhaps their lives."

The Vampire of the Great Lakes: Exotic Species Get Attention in Schools

by Julie Zeidner

They look harmless enough, but exotic species in the Great Lakes have the potential to wreak havoc in the ecosystem.

First came the sea lamprey, then followed the zebra mussel, Eurasian ruffe, and round goby. Brought over in ballast water from Eastern Europe, these exotic species have found a way to dominate in their new environment. Either by leaching off lake trout, filtering essential nutrients out of the water, or pushing out native fish, exotic species are more than surviving—they're multiplying by the millions.

Helen Domske is on a mission. With jars full of preserved exotic specimens, posters, Sea Grant fact sheets and videos about them, Domske helps teachers spread the word to their students about these aquatic pests. While education may not prevent them from spreading through the Great Lakes, information about exotic species can help foster a respect and stewardship of the environment.

"When you think of the ruffe or goby, they look so small and innocent," said Domske, a New York Sea Grant extension specialist and associate director of the University of Buffalo's Great Lakes Program. "And yet the impact they can have on the entire Great Lakes ecosystem is mind boggling."

A Cornell University approach called "Teach the Teachers" has enabled Domske to instruct more than 500 teachers on exotic species education throughout the counties adjacent to Lakes Erie and Ontario. Although Domske also visits schools to teach students about exotic species, her workshops for teachers have even greater impact. These teachers then go on to instruct dozens of students and other teachers. Once teachers are empowered with the information, they might use exotic species education in their classrooms in the following years, Domske said. And since exotic species are making headlines in newspapers throughout the Great Lakes states, teachers can keep their students up to date on a current environmental issue that is dynamic, and unlikely to subside anytime soon.

"Students are interested in the issue because it's something local," said Tom Cooper, a seventh grade science teacher at Gowanda Central in Lake Erie, who has participated in several workshops sponsored by Domske. He keeps a fish tank with live zebra mussels, as well as jars of exotic fish and invertebrates in the classroom for students to examine. "The students ask questions like 'How do they make their shells? How can you tell how old they are or whether they're a male or a female?"

One creature that captures their attention is the Eurasian ruffe. The sharp-spined fish that feeds on the eggs of other fish in complete darkness, was first identified in Duluth, MN. in 1986. In just a decade, the ruffe—less than six inches long—has become the dominant fish in parts of Lakes Superior, and has just spread to Lake Huron. The ruffe's ability to multiply rapidly—laying anywhere from 13,000 to 100,000 eggs per season—and their aggressive behavior, is leading to the demise of other forage fish. Scientists have observed a dramatic decline in sculpins, shiners, and darters, fish that form the base of the food chain for larger sportfish, Domske said. What's even more worrisome is ruffe, who are thriving in the chilly northern Great Lakes, would fluorish in warmer Lake Erie. There, ruffe would compete with walleye and yellow perch, favorite sportfish. While the ruffe are not in New York yet, fisheries managers are bracing themselves.

Helen Domske at the Lewiston-Porter Middle School. Photo by Pat MacNeill.

The U.S. Fish and Wildlife Service has issued a "Wanted" poster urging anglers who spot a ruffe in Lake Erie to capture, kill, and preserve it for identification.

Sea Grant teamed up with the state agency to get the word out about the ruffe in New York. At teacher workshops, Domske points to a bottle-filled with preserved ruffe to demonstrate how fierce these prickly creatures would appear to other fish their size.

"With very sharp spines on their dorsal fins, they're armed," said Domske, noting that they have no natural predators in the Great Lakes. "They're like the stealth bombers who work in the dark, plus there's nothing likely to control them."

Mistaken for bait fish or transported in live wells in boats, anglers might trailer their boats to other locations with the exotic hitchhikers on board, unknowingly facilitating their spread. Workshops for the fishing community are another way for Domske to spread the message about them.

The round goby, a bottom dwelling six-inch fish from the Black and Caspian Seas—so aggressive that it drives native fish out of prime nesting sites—is another fish that has people in the Great Lakes concerned. In less than six years since it was first discovered in Lake Michigan by David Jude, a research scientist at the University of Michigan, the round goby has spread to all five Great Lakes.

With its aggressive behavior and extraordinary reproductive cycle—spawning every 20 days up to six times a year—the goby also outcompetes forage fish, upsetting the natural balance of the ecosystem, Domske warned. Each goby can eat up to 100 zebra mussels a day. Since zebra mussels are known to accumulate toxins in their flesh, scientists are concerned about the potential threat of toxins working their way up the food chain from gobies to larger predators.

Exotic species are not only changing the Great Lakes in unexpected ways, but threatening biodiversity. Since the colonization of the striped mollusk throughout the Great Lakes, people have observed a dramatic improvement in water clarity as a result of zebra mussels filtering out phytoplankton. Teachers and students learn that clearer water doesn't mean cleaner water.

"The hardest sell that I have," Domske said, "is trying to explain that just because Lake Erie is clearer, doesn't mean its healthier." She explains to teachers that clearer water also indicates a decline in phytoplankton, which could impact the natural food web. Clearer water also allows sunlight to penetrate to the bottom of the lake stimulating excessive plant production. "If you're a cottage owner who likes to swim, soon your entire beach will be filled up with nuisance plants."

Native fish and mollusks that are part of the Great Lakes remarkable biodiversity are endangered by exotic invaders, and some are driven to extinction. The lake trout nearly disappeared altogether from the Great Lakes before a chemical was finally discovered to control sea lamprey. Native clams and mussels are also being eliminated from the ecosystem as a result of the zebra mussel.

"Students say they don't want to lose any more species on the planet," said Domske. "But may not realize this is happening right here in the Great Lakes."

In the fourth grade, students learn about sea lamprey and the zebra mussel. "They might ask if zebra mussels will come through the pipes in their home and get into their bath," Domske said. "And boy do you have their attention," she said, "when they're shown the suction-coned mouth of the sea lamprey, which she calls the 'vampire of the Great Lakes."

By the time students are in eighth grade they've already mastered some general concepts of fish ecology. Exotic species give them insight into predator/prey relationships, and how the environment can be changed by their introduction. With every step, teachers can help raise the students level of awareness by showing them exotic specimens or bringing in science articles from the newspaper to stimulate discussion.

"Children find living things interesting and exciting," Domske said. "So if you can channel that innate quest for knowledge and keep their interest in the environment strong, then as adults they will make the right decisions for the future."

"Plus there's nothing likely to control them."

Zebra Mussels along Lake Erie. Photo from Visualizing the Great Lakes collection. Photo courtesy Great Lakes Environmental Research Lab.

Tracking the Zebra Mussel Invasion

by Judy Hogan

While no stranger to European waters—written records document the pesty mollusk as far back as 600 years in Eastern Europe and Western Asia— the zebra mussel first appeared in North America in the Great Lakes basin in 1988. It quickly proved to be an expensive nuisance by clogging public drinking water treatment plants, electric generation plants, industrial plant pipes and boat intakes, disrupting natural ecosystems, and littering beaches with its sharp shells and rotting meat. Cleanup costs since 1988 have been projected to total more than $300 million.

Zebra mussels spread rapidly. Between 1988 and 1990, extensive colonies of mussels were reported in the western basin of Lake Erie. The zebra mussel was also found in water treatment and industrial water systems in the Detroit River below Lake St. Clair, and along the north and south shores of Lake Erie. By the end of 1991, the mussel was in all five of the Great Lakes and connecting waterways, the St. Lawrence River, the Erie Canal, and the eastern end of the Mohawk River, Cayuga and Seneca Lakes. The mollusks made their way to the Susquehanna River, the Hudson River, the Illinois River,the Mississippi River, the Tennessee River and the Ohio River.

In the ecosystem, dense zebra mussel populations impact existing food webs. Zebra mussels not only attach to the shells of other organisms and other aquatic surfaces, but compete for the same food as fish larvae. Their filter feeding dramatically reduces phytoplankton and zooplankton—small plants and animals that form the base of the food chain.

What's more troublesome is the zebra mussel is still spreading.The species has traveled almost clear across the country. Since appearing in the Great Lakes region, zebra mussels have invaded waters in at least 19 states east of the Rocky Mountains; from New York's Canadian border (they've also claimed Ontario and Quebec waters) down to Tennessee, Mississippi and as far south as New Orleans, and west into Arkansas and Oklahoma. They've even been sighted on an out-of-state boat heading for California waters, but were removed before they could claim a new home.

The dramatic spread of zebra mussels was predicted back in 1988, said Charles O'Neill, a New York Sea Grant coastal resources extension specialist and project director of the National Zebra Mussel Information Clearinghouse. The Clearinghouse, initiated by Sea Grant in 1990, tracks the spread of zebra mussels throughout North America. The clearinghouse's bimonthly publication, *Dreissena!* offers research- and policy-based information on all facets of zebra mussel biology, ecology, impacts, and control.

"While we expected the rapid spread through interconnected waterways, we didn't expect the transport to inland bodies of water to happen as quickly, " said O'Neill said, noting that they are also now being transported by humans through boat usage."

The Clearinghouse is one of many zebra mussel-related programming efforts New York Sea Grant has supported. In addition to extensive research on understanding the effects of the zebra mussel on the ecosystem and methods to mitigate its effects, Sea Grant has supported numerous educational programs. In 1994, Sea Grant extension specialists produced a nationwide satellite teleconference as the kickoff for the Nationwide Zebra Mussel Initiative. More than 200 people from more than 20 different states participated.

Sea Grant specialists have also developed a zebra mussel education program focusing on environmental impacts, control measures, and regulatory issues for user groups, including boaters.

Sea Grant-funded researchers at the Rensselaer Polytechnic Institute (RPI) believe that early detection of zebra mussels could help prevent the damage they inflict as adults. Sandra Nierzwicki-Bauer, chairman of biology at RPI and director of RPI's Darrin Fresh Water Institute, and Marc Frischer, a postdoctoral research associate, are investigating the use of DNA genetic probes to test for the presence of zebra mussel larvae, known as veligers.

Their genetic probe is also providing information about the zebra mussel's evolutionary history to improve our basic understanding of this animal, Frischer said.

What's more troublesome is the zebra mussel is still spreading

Zebra Mussels Cause Big Changes in Lake Oneida

by Julie Zeidner

The zebra mussel (*Dreissena polymorpha*) is changing the ecosystem in unexpected ways. With the proliferation of the exotic mollusk in Lake Oneida, researchers have observed an explosion of small, bottom-dwelling invertebrates including larvae, amphipods, *Daphnia*, flies, and mites. Plant growth has also skyrocketed in the lake.

- Nutrients in the ecosystem are shunted to the bottom of the lake where the filter-feeding zebra mussel sits. Benthic invertebrates benefit from the zebra mussel's company, feeding off its waste or using its shell as habitat.
- Yellow perch, a popular Lake Oneida sportfish, also seems to be benefitting from the changes in the ecosystem brought about by the zebra mussel, said Edward Mills, senior research associate and director of the Cornell University Biological Field Station. In a New York Sea Grant-funded study, Mills and Sea Grant Scholar Chris Mayer measured the responses of fish populations to the invasion of the zebra mussel in Lake Oneida. They observed that yellow perch are growing rapidly in their first year of life having switched from a diet of zooplankton to an abundant supply of benthic invertebrates.
- "Yellow perch weigh the most they've ever weighed in thirty years," said Mills. However, their rapid weight gain may have a negative impact on the walleye, another favorite sportfish of anglers. Researchers are now studying the diets of young walleye to determine why they're not growing as fast. The walleye like to eat yellow perch young-of-the-year, but with yellow perch growing so fast "they're getting out of the window for walleye to feed on them," Mills said. It also appears that adult walleye are canabilizing their own young, Mills said.
- Once macrophyte beds—large weeds that grow in Lake Oneida—could only be found along the shoreline. Now they are extending out into deeper water. The zebra mussel filters out phytoplankton making the water clearer, and sunlight is able to permeate to the bottom of the lake stimulating plant growth.
- The macrophyte beds not only create new habitat for macroinvertebrates, but are a refuge for yellow perch, as well as bass and sunfish—two species that had not been abundant in Lake Oneida, which could begin to prosper now.
- Blue-green algae, too big for the zebra mussel to consume, was once present for only two months during the summer in Lake Oneida. Now blue-green algae is present from July until mid-November. That's because zebra mussels are filtering out the smaller algae, which normally compete with blue-green algae.
- "In a single year, Lake Oneida has the clearest water we've ever seen," Mills said. "to the most turbid water we've ever seen." When blue-green algae makes the lake turbid, it might give the false impression that the lake is overfertilized from sewage byproducts like phosphorus. The opposite case is true, Mills said. With the upgrading of sewage treatments plants, the amount of phosphorus in all the Great Lakes and Lake Oneida, has significantly decreased. This fact, coupled with the zebra mussel's enormous plant diet, has dramatically reduced overall nutrients in these lakes.
- People are ambivalent about the changes in the lake.
- "If you come to Oneida to fish for walleye, and end up with another species, it's not going to be too popular," Mills said. "What we're going through is a juggling act. Some species are doing well, and others are not."

"What we're going through is a juggling act"

The spread of the zebra mussel. Map by P. MacNeill

An Explosion of Harmful Algal Blooms has Scientists Searching for Answers

by Julie Zeidner

An explosion of toxic and harmful algae impacting marine ecosystems and fisheries resources worldwide from brown to red tides point to changes in the environment that scientists are just beginning to understand.

Explanations for the expansion of these harmful blooms include coastal development, global warming, and transport of algae in ballast water. Bay floors once dominated by eelgrass have been replaced by muddy bottoms and phytoplankton as a result of coastal development and urban runoff. This process, called eutrophication, is very obvious in places like western Long Island Sound, where algae blooms disrupt the ecosystem by depriving other marine life of light and oxygen.

Brown tide not only blocks sunlight to other underwater plants, but has a toxic effect on bivalves, inhibiting their ability to eat, grow, and reproduce. The Peconic Bay scallop, one of Long Island's most anticipated seafood products had a dockside value of $2 million and represented 27 percent of the entire scallop sales in the United States prior to brown tide's appearance in 1985. The algal blooms have reduced the annual fall scallop harvest yields to only a few thousand dollars.

Paralytic Shellfish Poisoning (PSP), caused by periodic blooms of red tide, has threatened nearshore shellfisheries in the northeast for decades, and most recently, valuable offshore harvesting areas including those of the surfclam and ocean quahog. PSP not only has the potential to harm the seafood industry, but also poses a serious public health concern.

New York Sea Grant-funded researchers at the Marine Sciences Research Center (MSRC) at the State University of New York (SUNY) at Stony Brook have made progress in understanding these harmful algal blooms, and their effects on other marine plants and animals. Phytoplankton ecologist Elizabeth Cosper has been able to single out factors like iron that stimulate the growth of brown tide, and to isolate naturally present viruses in seawater that can rapidly lead to its demise. Darcy Lonsdale, a MSRC zooplankton ecologist, and Gordon Taylor, a MSRC microbiologist, have studied the harm brown tide can do to other microscopic organisms that form the basis of the food chain for larger fish. MSRC benthic ecologist Monica Bricelj demonstrated brown tide's toxic effects on shellfish. In two separate Sea Grant-funded projects, she and researcher Greg Boyer at the SUNY College of Environmental Science and Forestry have also made progress in the search for better PSP detection methods.

Scallop harvester on Long Island. Photo by Rick Dembow.

Following a Brown Tide Summit last fall organized by New York Sea Grant, MSRC, and the Peconic Estuary Program, that brought internationally recognized scientists and elected officials together for a forum to help solve the problem, a $1.5 million research initative was organized. New York Sea Grant, with funding from the Coastal Ocean Program of the National Oceanic and Atmospheric Administration, is in the final stages of selecting projects for the Brown Tide Research Initiative to find the answer to what causes brown tide.

Going Out After the Storm: Protecting Long Island's Shoreline from further Damage

by Julie Zeidner

There's no denying the power of the ocean. Anyone who has surfed at Montauk or battened down on Fire Island during a full gale will attest to it.

• This summer, when droves of tourists and day visitors plant their umbrellas in the sand along Long Island's 1,475-linear mile coastline, memories of the snowiest winter in more than five decades will fade. But signs of destruction from the fifth consecutive year of harsh weather are pronounced along the eroded shore. Powerful northeasters—lingering storms that cause intense wave action—hit Long Island in 1992 and 1993. Damage to public and private property and structures from the 1992 storm alone totaled more than $350 million.

• Over the next two winters erosion and flooding from another 17 storms caused further damage, and during the past year, the trend continued. Hurricanes Felix and Luis generated such large waves last summer that beaches counting on summer calm to rebuild themselves naturally were further shredded instead.

• What makes Long Island and its southern barrier islands especially susceptible to the ravages of hurricanes is its dense population more than 2.6 million year-round—making it the most populated coastal region on the East Coast.

• A common misperception about coastal erosion and flooding is that it affects only an elite group of oceanfront homeowners. The barrier islands off the south shore of Long Island are not only important for their ecological and recreational value, they are also a buffer against coastal flooding and erosion on the mainland.

• "The value of development on the barrier is minor compared to the value of property and structures found along the mainland shoreline," said Jay Tanski, a coastal geologist with the New York Sea Grant Institute. "Areas like Patchogue and Freeport have tens of thousands of homes threatened by flooding. And I don't know how you can say we're going to move Coney Island."

• Barrier islands and spits, among them Long Beach and Rockaway, also have intense development. Combined, south shore areas threatened by coastal erosion and flooding, have an estimated $10 billion worth of public and private infrastructure, property, and structures, according to state estimates.

• Even in an area as heavily developed as Long Island, state parks and other beaches along the Atlantic Ocean still attract an estimated ten million visitors per year. "This is a major recreational and economic resource that is also very important for the quality of life," Tanski said. "So managing the area to maximize use and access while working with natural erosion processes becomes very important."

Aerial view of Long Island. Photo by Jay Tanski.

• In response to coastal erosion and flooding arising from the severe storm of 1992, former Governor Mario Cuomo formed the Coastal Erosion Task Force. The storm-related problems required rapid responses. Working with elected officials, state agency heads, business and community leaders, as well as homeowner associations and individual property owners, Tanski and his colleagues from New York Sea Grant have played an integral role in helping these groups develop sound erosion management strategies. Prior to the storms of '92, Tanski had worked with officials from the state Coastal Management Program and Long Island Regional Planning Board on a South Shore Hazardous Management Plan. The plan served as framework for the Governor's Task Force, with many of its recommendations integrated into the task force report.

• Tanski is often called in to gauge the potential impact of breaches and new inlets on the bays and mainland. The pounding surf of the strong northeaster in 1992, for example, started a breach, enlarged by subsequent storms, that dug a 2,600-foot inlet on Westhampton barrier island. The breach destroyed or isolated hundreds of beachfront homes.

• "This was a unique opportunity to actually measure some of the impacts these breaches have on surrounding areas in a real world situation," Tanski said. Before the breach was closed by the Army Corps of Engineers, he worked with Daniel Conley, a coastal geologist at the Marine Sciences Research Center at the State University of New York at Stony Brook, to quantify the increased water exchange between the ocean and the back bay caused by the inlet. Information developed in the study helped lead to the adoption of a management plan that calls for closing new inlets to protect the mainland in the event of a breach until more detailed information on the full range of its impact is determined.

• Tanski is an old hand at the study of beach erosion's impact on Long Island. He worked with local and national coastal experts to develop a coastal erosion monitoring program that will help coastal managers and planners make more informed decisions about coastal projects. He is now working with state officials and the Army Corps of Engineers on implementing this program on Long Island. Tanski also worked with a National Park Service (NPS) committee on the development of an interim breach management plan in Great South Bay where Conley will use funding from NPS to further study the potential impact of breaches.

• One of Tanski's jobs is to advise the public on "when they have to be worried about erosion or not," he says, citing some misperceptions about coastal erosion that arise because the same data are interpreted differently by geologists, coastal planners, and homeowners.

• One example, Tanski adds, involves observations by geologists of a gradual rise in sea level that is causing barrier islands to migrate landward over geologic time.

• "Geologists tend to think in longer time scales than most people," Tanski said. "Some coastal processes can take hundreds to thousands of years. However, if you look at some portions of the barrier islands on the south shore of Long Island, you find places that have not migrated in 1,500 years. From a manager's perspective, this slow movement may still accommodate a number of uses without undue risk. A geologist might say this is a dynamic moving landform, and it is."

• One point of agreement is that the construction of inlets that enable boaters to pass from the bay to the ocean at Shinnecock, Moriches, Fire Island, Jones Inlet, Rockaway, and East Rockaway has had a significant impact on coastal processes in the area. Theses inlets block the natural transport of sand from east to west, causing severe erosion. Storm waves ravage beaches where sand is depleted causing serious problems.

• Erosion can be a very site-specific problem, influenced by a range of factors, and often quanitative information on actual shoreline erosion is lacking, Tanski said. The erosion specialist reached more than 900 individual property owners on Long Island last year, using site visits, presentations, and written materials to explain the specific coastal processes at work and potential control measures at each site.

• "There's no one best solution for coastal erosion," Tanski said. "Each section of the shoreline responds differently to physical processes, and that in turn is going to determine what might be the best approach for a particular area."

• Techniques for protecting the shoreline and property can vary from nonstructural alternatives like vegetation and beach nourishment to structural alternatives such as engineered groins, seawalls or breakwaters to management approaches such as zoning ordinances and flood regulations.

• And sometimes the best solution for coastal erosion might be to do nothing. "When I work with people a lot of times the most gratifying thing," Tanski said, "is when they change their mind about putting in a structure when they don't need one, saving money, and potentially saving unnecessary changes in the natural environment."

• One Long Island homeowners association on the north shore used information supplied by Sea Grant to decide against installing a planned, but unnecessary bulkhead and saved $90,000, Tanski said. His recommendations at a site visit in Islip led town officials to implement a maintenance program that saved a $20,000 bulkhead and the shellfish hatchery it protected from collapsing. In response to the severe erosion caused along the south shore by the hurricane waves during the summer of 1995, Tanski worked with state officials and SUNY researchers to quantify the changes in the beaches. Congressman Rick Lazio (R-NY) asked Tanski to participate in a tour of Fire Island to give officials from Washington more understanding of the coastal erosion problems confronting Long Island. The congressman said Tanski's technical and historical input "helped indicate the ongoing need for Sea Grant's presence on Long Island."

• Increasing community awareness about what beach repair efforts can and can't do—and how lengthy and expensive various options to control erosion are likely to be—is an ongoing effort for Sea Grant. "Erosion management is a difficult problem to deal with," Tanski said. "Most erosion problems are site specific, but the art is really how you apply the options you have for addressing them."

Many seafood markets are staffed by Hispanics in Queens, New York. Photo by Julie Zeidner.

Survey finds Hispanic Population in Metropolitan New York has a Taste for Seafood

by Julie Zeidner

As one of the fastest growing ethnic groups in the United States, the Hispanic population represents a significant consumer market for fish and shellfish products. In a New York Sea Grant-sponsored study, Cornell University researchers examined some of the beliefs and preferences about fish and shellfish that exist within the Hispanic population in metropolitan New York.

Among the 373 individuals of Hispanic descent in Manhattan and Queens who responded to the Cornell survey, the majority of respondents said they like the taste of seafood and think it's good for their health. Studies conducted on the general population found that price is often a barrier to seafood consumption. In this survey of Hispanic consumers, 77 percent of respondents agreed that fresh fish and shellfish were expensive, but the majority (75 percent) believed they were still worth buying. Ninety-seven percent of respondents ate seafood and reported consuming some kind of seafood an average of 3.3 times in the two weeks preceding the survey. Survey respondents ate more tuna than any other product (the same as the population at large, according to the National Marine Fisheries Service) due to its affordability and widespread availability. Shrimp was the other most commonly consumed product.

"It is important to learn more about Hispanic households in order to meet the needs of this growing population," said Carole Bisogni, Cornell University associate professor of nutrition. "Knowledge of traditions, perceptions, and beliefs concerning the foods Hispanic consumers eat will help nutrition educators better tailor educational programs to this audience, and will allow marketers to better meet their needs."

Understanding the nutritional needs of Hispanics is becoming increasingly important as this minority population continues to grow in the United States. The word

"Hispanic," as defined by the U.S. Office of Management and Budget, is "a person of Mexican, Puerto Rican, Cuban, Central, or South American, or other Spanish culture or origin, regardless of race." According to the 1990 Census, there are 22.3 million Hispanic people, composing nine percent of the nation's population—a 53 percent increase since 1980. By the year 2020, Hispanics are expected to make up about 15 percent of the population, making this the largest minority group in the United States. Eighty-seven percent of Hispanics live in urban areas. 1990 Census reports indicate that 2.8 million Hispanics live in the metropolitan New York City area, with more than 380,000 Hispanics residing in Manhattan and more than 380,000 in Queens—the two boroughs that were the focus of the Cornell survey.

Another important reason for studying the food consumption practices and nutrition needs of Hispanics is that recent statistics from the U.S. Department of Health and Human Services show that Hispanic Americans may be at greater risk than the average American population for weight gain and diabetes, said Bisogni.

Seafood, high in nutrients and low in fat, could be an important part of the Hispanic diet. Since studies of consumer perceptions of fish and shellfish to date have primarily been on samples in which the Hispanic population was not well represented, it was not known if Hispanic consumers hold similar or different perceptions and concerns about fish and shellfish than the general population.

Seafood consumption among the general population has essentially remained static in the United States for the past 50 years, according to the National Marine Fisheries Service. The average American consumed 15.2 pounds of fish and shellfish in 1994, which was less than 8 percent of the total for all high-protein animal foods consumed in the United States—the highest totals went to beef and pork.

Previous studies of Hispanic consumers by Diva Sanjur, Cornell University nutrition professor, determined that the food habits of immigrants undergo adaptation in the United States as these individuals are exposed to different selections of foods, as well as new shopping and cooking techniques. For example, those Hispanic consumers who came from an agrarian lifestyle are often more accustomed to shopping frequently at local vendors for fresh foods, but in this country, they encounter the modern supermarket and its abundance of packaged foods.

In time, the Hispanic population may be picking up the preferences and habits of the larger population and eating fattier foods, Bisogni said. "Among young Hispanics, especially, there may be peer pressure to eat at places like McDonald's," said Bisogni, noting that a focus area for nutritionists could be helping Hispanics maintain their traditional food preferences in the United States.

The newest Cornell study, conducted by Bisogni and Sea Grant scholar Stephanie Weinstein, a graduate student in nutritional sciences at Cornell University, aims to better understand the Hispanic consumer.

"As nutritionists, we tend to think of Hispanics as one group, but in actuality the Hispanic group includes individuals from a wide variety of countries," Bisogni said. More than six in 10 Hispanic citizens nationwide identify themselves as Mexican, about one in 10 as Puerto Rican, and about one in 20 as Cuban, according to the U.S. Census. However, the Hispanic population is becoming increasingly varied, with growing numbers from the Dominican Republic, Columbia, Ecuador, other parts of South America, and elsewhere.

To understand the factors influencing seafood consumption, it is important to study the phenomenon regionally. Some of the factors influencing whether Hispanics purchase seafood may have to do with their country of origin, and whether they grew up in a coastal or inland region. In New York City, they might purchase more seafood simply because they have good access to it, whereas in inland areas like upstate New York and central New England this may not be the case.

Many shops in Queens, New York cater to Hispanic clientele. Photo by Julie Zeidner.

Another important survey result indicated that seafood was a traditional part of the Hispanic diet. Studies have shown that one barrier to seafood consumption among the general public is that they do not eat seafood as children. Two-thirds of the survey respondents reported that seafood was part of their country's or family's traditional diet. Focus group discussions prior to the fish and shellfish survey indicated that religious practices frequently influenced Hispanic seafood consumption. For example, during the Lenten period before Easter, Catholics often consume more fish and seafood. When asked if they did eat more seafood during Lent, 67 percent of survey respondents agreed.

Home is the most common place for consuming seafood, with restaurants a fairly distant second. In metropolitan New York, there are numerous fish markets accessible to Hispanics, and 80 percent of survey respondents agreed that there was a fish market close to their home. More than 73 percent said they were usually satisfied with the quality of fish and shellfish available.

The majority of respondents had positive beliefs concerning the nutritional value and healthfulness of fish and shellfish. Ninety-two percent of the respondents consider fish good for their family's health, and between 91 and 94 percent agreed that fish is a good source of protein.

Concerns about seafood safety and contaminants in certain marine and fresh waters that caused consumers to be more cautious about eating seafood reached a peak in the early '90s, but more recent surveys show this concern is no longer generally associated with seafood consumption. Survey respondents (81 percent) said they too were concerned that fish and shellfish come from polluted waters, and another 74 percent felt that some types of fish may contain chemical pollutants. However, only 35 percent believed that fish or shellfish might be unsafe to eat.

While 64 percent of respondents said they thought that cooking seafood thoroughly would reduce health risks by killing bacteria or viruses, another 53 percent were unaware that raw fish, such as Japanese-style sushi could cause illness.

Concerns about seafood safety did not appear to be a significant factor for most consumers in 1994, when 760 New York and New Jersey consumers were surveyed for an aquaculture marketing study. Conducted by Ken Gall, New York Sea Grant seafood specialist, and Linda O'Dierno, fisheries and aquaculture program coordinator with the N.J. Department of Agriculture, and supported by the Northeast Regional Aquaculture Center, the survey found that only five percent of the respondents thought there was a need for more information or assurances about product safety.

"Consumers are strongly motivated to eat seafood because they enjoy the taste of certain products, and they have a sense that seafood is a healthy, low fat food choice," Gall said. "Most consumers want information that can help them make informed decisions about their seafood selections."

The most frequently identified reason for choosing seafood in the Gall/O'Dierno study was taste (92 percent). The second reason was the healthfulness of seafood.

Still, concerns about seafood nutrition and safety call up the need for improved sensitivity among food and nutrition eduators, as well as scientists and industry groups, to respond to the product information needs of Hispanics, Bisogni said.

"When the needs of the Hispanic population are better addressed," Bisogni said, "Hispanic consumers should be able to take advantage of the taste, convenience, and health benefits that fish and shellfish have to offer."

(A related article appeared in Nor'Easter, Vol. 7. No.1.)

Getting the Word Out About New York Seafood

New York's Seafood Council is the New York seafood industry's marketing and promotion organization. Its membership includes individuals and businesses from all sectors of the state's seafood industry, and its program and activities are guided by a board of directors from each of the industry's sectors. New York's Seafood Council and New York Sea Grant have worked together since 1990 to develop a variety of programs designed to help consumers, the seafood industry, and government decision makers better understand the state's seafood industry and the products it produces. Some recent program accomplishments include:

- A series of industry profiles that describe various sectors of New York's seafood industry are produced for each issue of the Seafood Council's newsletter. Industry profiles developed describe the entire seafood industry, retail seafood markets, the hard clam industry, the lobster industry, New York's largest port—Montauk, and Long Island's surf clam processors.

- A "Seafood Nutrition Chart" distributed to more than a thousand New York retail stores and restaurants are providing consumers with information on the nutritional composition of the top 20 seafood products consumed in the U.S. and common fish and shellfish consumed in New York.

- A bilingual (English/Spanish) "Molluscan Shellfish Quality Guidelines" poster that outlines proper receiving, handling, storage, and display procedures for clams, oysters, and mussels was distributed to several thousand retail stores and restaurants in New York. This poster was jointly produced by the Seafood Council, Sea Grant, Long Island Shellfish Dealers Association and the New York State Departments of Health, Environmental Conservation, and Agriculture and Markets.

- A series of three promotional posters are being displayed in retail stores and restaurants across New York that highlight "Long Island Fresh" seafood, "New York's Seafood Industry," and "New York Seafood: A Meal for all Seasons."

- Brochures and factsheets on traditional New York seafood products and "Hidden Treasures," fish and shellfish species that are abundant but unfamiliar to many consumers like mackerel, herring, sea robin, skate, dogfish, ocean pout and Jonah crab, have been distributed to thousands of New York consumers by seafood businesses across the state.

- Press releases, testimony, and resource support on seafood products, safety issues, and the seafood industry has been provided to government decision makers, and the media.

For more information about these programs or printed materials contact Sea Grant's Seafood Specialist Ken Gall at 516.632.8730 or New York Seafood Council President Roger Tollefsen at 516.728.3474.

Sea Grant Helps Educate Future Decision Makers

By Judith N. Hogan

Whether their career goal involves scientific research or environmental policy-making, New York Sea Grant is helping graduate students become well-prepared professionals.

Training students in the marine and coastal sciences and other fields relevant to the sustainable use and management of coastal resources is an important priority for New York Sea Grant. In 1994 and 1995, Sea Grant provided more than $389,000 in support of 30 Sea Grant scholarships on 30 different research projects. Two additional scholars worked with Sea Grant extension specialists on coastal erosion and public outreach projects. With Sea Grant support, students made substantial progress toward the completion of their masters and doctoral theses.

Jointly with the Hudson River National Estuarine Research Reserve Program, New York Sea Grant created a new fellowship program for graduate students focusing on the Hudson River in 1994. This fellowship, based on a mutual and long-standing commitment to research and education, fosters the development of young scientists interested in estuarine issues. The fellowship stimulates useful estuarine research, and encourages more researchers to utilize the Hudson River National Estuarine Research Reserve sites in their work.

"As a competitive fellowship, we select one student per year as a recipient, mainly on the merits of the research project they propose to conduct," said Cornelia Schlenk, New York Sea Grant's assistant director. The Sea Grant/Industrial Fellowship, created in 1995 and sponsored by the National Sea Grant College Program, is another new program helping to accelerate the exchange of information and technologies between universities and industries. The program, which supports up to seven graduate students nationwide each year, promotes interaction between top scientists and their industrial counterparts, and fosters long-term relationships between Sea Grant colleges and companies.

Graduate student Mark Ricotta is receiving support from Wearlon, a division of Decora Manufacturing, to study surfaces that not only show non-stick, but drag reduction characteristics with New York Sea Grant researcher Robert E. Baier at the State University of New York at Buffalo. Their research could lead to the design of ships that not only stay clean, but go faster and consume less fuel.

For those graduate students interested in how science is used to shape public policy, the Dean John A. Knauss Marine Policy Fellowship provides a unique opportunity. Since 1979, the program has matched highly qualified graduate students with hosts in legislative offices or government agencies in Washington D.C. During the one-year fellowship, students get first-hand experience in coastal policy.

For Knauss Fellow Robert Childers, it was an opportunity to start a new career. Childers, a research chemist with Eastman Kodak, returned to school for a master's degree in organic chemistry at the Marine Sciences Research Center (MSRC) at the State University of New York at Stony Brook.

As a Knauss fellow, Childers worked with congressional staff from the Subcommittee on Fisheries, Wildlife and Oceans to help develop important fisheries-related legislation. He was part of a team that wrote language for the reauthorization of the Magnuson Act, which gives the United States the exclusive right to manage fisheries within 200 miles of its coastlines.

"I was delighted to be chosen as a legislative fellow," said Childers, adding that his background and experience proved useful.

The Knauss Fellowship was also a valuable learning experience for New York Sea Grant Scholar Robert Cho, who said he was glad to leave "the confines of the laboratory" at MSRC to work as a legislative assistant for Representative Dan Hamburg (D- CA). Since Hamburg served on two congressional committees, Public Works and Transportation and Merchant Marine and Fisheries, Cho had the opportunity to apply his marine science expertise in several important environmental areas. His responsibilities included research and evaluation of bills such as the reauthorization of the Clean Water Act and Safe Drinking Water law, as well as reform of pesticide regulations.

"This was a wonderful opportunity to see how science is utilized at the national level of policy making," Cho said. "The year provided me with a first-hand look at the development of national environmental policy."

Sea Grant scholars often go on to successful careers in academia, industry and government. Their experiences help them understand the changing nature of science and research in marine and coastal problems, and they are better equipped to make decisions in government resource management.

Sea Grant Scholars 1994-1995

Leslie Adler
State University of New York at Stony Brook

Jeffrey A. Buckel
State University of New York at Stony Brook

Chen-Yu Cheng
State University of New York at Buffalo

***Robert D. Cho**
State University of New York at Stony Brook

Jill E. DiTommaso
State University of New York at Buffalo

Suzanne E. Dorsey
State University of New York at Stony Brook

Jeffrey P. Fisher
Cornell University

Gideon Gal
Cornell University

***Christopher J. Gobler**
State University of New York at Stony Brook

***Jonathan A. Hare**
State University of New York at Stony Brook

Jixiang He
SUNY College of Environmental Science and Forestry

Darryl W. Hondorp
State University of New York at Buffalo

David C. Hoyal
State University of New York at Buffalo

XiChng Hu
SUNY College of Environmental Science and Forestry

***Nasseer A.S. Idrisi**
SUNY College of Environmental Science and Forestry

Rajeev Jain
State University of New York at Buffalo

***David Laby**
State University of New York at Stony Brook

***Daniel E. Lewis**
State University of New York at Stony Brook

***Andrew E. Matthews**
State University of New York at Stony Brook

Christine M. Mayer
Cornell University

Reyhan Mehran
State University of New York at Stony Brook

Gideon Oenga
State University of New York at Oswego

Richard J. Ruby
SUNY College of Environmental Science and Forestry

Adrian P. Spidle
Cornell University

***Nancy D. Steinberg**
State University of New York at Stony Brook

Wenxiong Wang
State University of New York at Stony Brook

Stephanie Weinstein
Cornell University

Jane A. Wyllie
Rensselaer Polytechnic Institute

Lianchu Zhang
State University of New York at Stony Brook

*Denotes Thesis Completion Award Winner

Sea Grant Industrial Fellows Program

Mark S. Ricotta
State University of New York at Buffalo

Dean John A. Knauss Marine Policy Fellowship

Robert Childers
State University of New York at Stony Brook

Robert D. Cho
State University of New York at Stony Brook

Elizabeth M. Lamoureux
State University of New York at Stony Brook

Sea Grant Extension Scholars

Gillian S. Earnest
SUNY College of Environmental Science and Forestry

Benjamin Strong
State University of New York at Stony Brook

Knauss Fellow Robert Childers

Hudson River National Estuarine Research Reserve Cooperative Research Fellowship

Laurence S. Fernberg
Fordham University

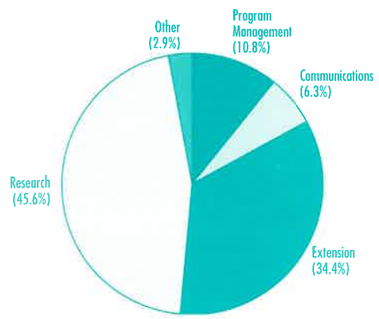
Lisamarie Windham
Rutgers University

Institute Funding 1994–1995

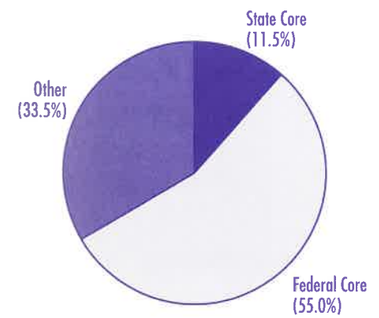
State, Federal and Other Funds

	1994	1995
■ PROGRAM MANAGEMENT	$394,969	$388,138
■ COMMUNICATIONS	$220,737	$234,501
■ EXTENSION	$1,271,744	$1,233,913
■ RESEARCH		
• Technology and Product Development	$379,181	$352,024
• Fisheries – Great Lakes	38,817	177,564
• Fisheries – Marine	315,409	214,789
• Coastal Studies – Contaminants & Environmental Quality	295,299	146,982
• Coastal Studies – Environmental Processes	139,318	62,209
• Human Dimensions	85,003	81,463
• Special Initiatives – Zebra Mussels	243,624	187,192
– Biotechnology	300,000	300,000
• Percent of Research Funds Spent on Scholars	12%	12%
■ TOTAL RESEARCH	$1,796,651	$1,522,223
■ OTHER		
• Fellowships	$76,878	$50,561
• Conferences/Workshops/Special Projects	$42,280	$42,484
■ TOTAL OTHER	$119,158	$93,045
TOTAL FUNDS ALLOCATED	**$3,803,259**	**$3,471,830**
■ NON-FEDERAL IN-KIND SUPPORT	$1,596,334	$1,471,173
■ COMBINED TOTAL EFFORT	$5,399,593	$4,943,003

Distribution of Funding Among Program Elements (years combined)



Funding Sources (years combined)



Note: "other" includes additional state, federal, Cornell, SUNY and private funds received by program.

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■ SUNY AT STONY BROOK
Dr. Anne McElroy, *Director*
Cornelia Schlenk, *Assistant Director*
Stefanie Massucci, *Acting Fiscal Officer*
Julie Zeidner, *Communicator*
Judy Hogan, *Assistant Communicator*

Sea Grant Extension Offices

■ CORNELL UNIVERSITY, ITHACA
Dale Baker, *Associate Director/Program Leader*

■ SUNY AT BROCKPORT
Chuck O'Neill, *Coastal Management Specialist*
David MacNeill, *Fisheries Specialist*

■ SUNY AT BUFFALO
Helen Domske, *Great Lakes Ecosystems Specialist*

■ EAST AURORA
David Greene, *Native American Coastal Lands Specialist*
Jennifer Pultz, *Great Lakes Environmental Quality Specialist*

■ SUNY AT OSWEGO
Diane Kuehn, *Tourism Specialist*
Patricia Peterson, *Production Assistant and Great Lakes Information Coordinator*
David White, *Great Lakes Program Coordinator/ Coastal Recreational Specialist*

■ KINGSTON
Nordica Holochuck, *Water Quality Specialist*

■ RIVERHEAD
Robert Kent, *Marine Program Coordinator/ Marine Education Specialist*
Mark Malchoff, *Marine Recreation Specialist*

■ SUNY AT STONY BROOK
Ken Gall, *Seafood Specialist*
Jay Tanksi, *Coastal Processes Specialist*
Kimberly Zimmer, *Program Assistant/ Long Island Sound Study Outreach Coordinator*

Research Project Titles 1994-1995

TECHNOLOGY AND PRODUCT DEVELOPMENT

Electrochemical approaches for the analysis of PSP toxins. G.L. Boyer (SUNY College of Environmental Science and Forestry). R/SHH-3

Impacts and mitigation of large-scale aquaculture in the Great Lakes. J.K. Buttner and J.C. Makarewicz (SUNY College at Brockport) and R.H. Findlay (University of Maine). R/ATD-5

Marine natural products: novel biochemical probes and potential pharmaceutical agents. J.C. Clardy (Cornell University). R/XBP-3

Decompression sickness and complement activation, the role of diver's age. G.L. Logue and C.E.G. Lundgren (SUNY at Buffalo). R/DP-5

Methods for predicting susceptibility to decompression sickness based on complement activation and bubble occurrence in divers. C.E.G. Lundgren and G.L. Logue (SUNY at Buffalo). R/DP-4

Reduction of hatchery discharge pollution via mechanical removal and dietary manipulation affecting fecal solids characteristics. M.B. Timmons (Cornell University). R/ATD-4

DNA analysis of Atlantic and Gulf sturgeon populations and mixed assemblages. I.I. Wirgin (New York University Medical Center) and J.R. Waldman (Hudson River Foundation). R/XG-3

GREAT LAKES FISHERIES

Reproductive failure in atlantic salmon from the Finger Lakes: the nutritional etiology of the "cayuga syndrome." P.R. Bowser (Cornell University). R/FBF-7-PD

Dynamics of the mysid population in Lake Ontario. L.G. Rudstam and E.L. Mills (Cornell Biological Field Station), O.E. Johannsson (Canada Centre for Inland Waters, Ontario) and C.H. Greene (Cornell University). R/CMB-6

Benthic-pelagic coupling in Great Lakes ecosystems: the role of deepwater and slimy sculpins. D.J. Stewart (SUNY College of Environmental Science & Forestry). R/CE-6

Planktivore production in Lake Ontario: effects of prey availability, predation and spatial heterogeneity. D.J. Stewart (SUNY College of Environmental Science & Forestry), S.B. Brandt, (SUNY College at Buffalo) and W.G. Sprules (University of Toronto). R/CE-8

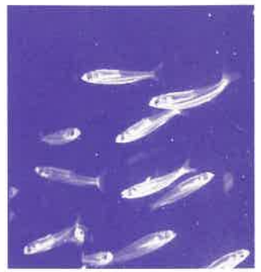
MARINE FISHERIES

Fate of paralytic shellfish poisoning (PSP) toxins in surfclams: implications for management of the offshore fishery. V.M. Bricelj (SUNY at Stony Brook). R/FBM-13

Relative susceptibility of bivalves to the brown tide alga *Aureococcus anophagefferens:* Comparison among species and life history stages. V.M. Bricelj (SUNY at Stony Brook). R/FBM-9

Impact of bluefish predation on young-of-the-year estuarine fishes. D.O. Conover (SUNY at Stony Brook). R/FBM-10

The Relationship between shell microgrowth patterns and physiological energetics of *Mya arenaria*. R.M. Cerrato and M.V. Bricelj (SUNY at Stony Brook). R/FBM-9



Relative susceptibility of bivalves to the brown tide alga *Aureococcus anophagefferens:* comparison among species and life history states. M.V. Bricelj (SUNY at Stony Brook). R/FBM-16

Recruitment and predation by bluefish on the continental shelf. D.O. Conover (SUNY at Stony Brook). R/FBM-17

Hudson river food web dynamics and the recruitment of striped bass. M.L. Pace, J.J. Cole and N.F. Caraco (Institute of Ecosystem Studies). R/FBM-15

CONTAMINANTS AND ENVIRONMENTAL QUALITY

Release of copper (Cu), chromium (Cr) and arsenic (As) from CCA-C pressure treated wood in the marine environment. V.T. Breslin and R.L. Swanson (SUNY at Stony Brook). R/EMS-8-PD

Recent chronology of the atmospheric deposition of PCB's, PAH's, pesticides, and metals to western Long Island Sound and environs. K.J. Cochran and B.J. Brownawell (SUNY at Stony Brook). R/CTP-9

Atmospheric deposition of organic contaminants and nutrients to an urban nearshore environment. B.J. Brownawell and R.L. Swanson (SUNY at Stony Brook). R/CTP-13

Bioavailability of sediment-bound metals for marine bivalves. N.S. Fisher and V.M. Bricelj (SUNY at Stony Brook) and S.N. Luoma (US Geological Survey, Menlo Park, CA). R/CTP-20

PCB degradation resulting from photolysis catalyzed and sensitized by naturally-occurring minerals and organics in Lake Ontario. R.J. Scrudato (SUNY College at Oswego). R/CTP-18

ENVIRONMENTAL PROCESSES

Environmental factors enhancing brown tide blooms: a field experimental approach. E.M. Cosper (SUNY at Stony Brook). R/CE-5

Distribution of submerged rooted vegetation beds in the tidal Hudson River. S.Findlay (Institute of Ecosystem Studies). R/CMB-7

Impact of brown tide *(Aureococcus anophagefferens)* on microbial food web processes in the Peconics Bay system. D.J. Lonsdale and G.T. Taylor (SUNY at Stony Brook). R/CE-7

HUMAN DIMENSIONS

Atlantic fishing communities and Japanese seafood markets: An ethnographic analysis of socio-economic integration. T.C. Bestor (Cornell University). R/SPD-3

Hispanics in metropolitan New York: perceptions and practices related to the quality, safety, and healthfulness of fish and seafood. C.A. Bisogni (Cornell University). R/SHH-2

Improving the role of science in service to society. J.R. Schubel (SUNY at Stony Brook). R/CO-3

Management and marketing adjustments to changing Lake Ontario sportfisheries. T.L. Brown (Cornell University). R/FHD-7

BIOTECHNOLOGY INITIATIVE

Mechanism of action of an immunosuppressive marine natural product: discodermolide and its cellular target. J.C. Clardy (Cornell University) and S.G. Schreiber (Harvard University). R/XBP-4

Liposomal delivery of hormones for crustacean aquaculture: formulation, biochemical mode of action, and physiology. G.R. Prestwich (SUNY at Stony Brook) and J.A. Hayward (Collaborative Laboratories, Inc.). R/ATD-6

ZEBRA MUSSEL INITIATIVE

Environmental and economic benefits from zebra mussel harvesting through contaminant reduction and product development. J.M. Regenstein (Cornell University). R/SWM-1

Control of zebra mussel veligers in water treatment plants by chemical coagulants. J.E. Van Benschoten (SUNY at Buffalo). R/EMS-7

Zebra mussels in the Susquehanna: Yes or no? Why or why not? W.N. Harman (SUNY College at Oneonta). R/CMB-8

Development and utilization of genetic probes for studying the planktonic ecology of the zebra mussel. S.A. Nierzwicki-Bauer and M.E. Frischer (Rensselaer Polytechnic Institute). R/XG-4

Compensatory responses of fish populations to the invasion of the zebra mussel *(Dreissena polymorpha)*: benthic - pelagic coupling. E.L. Mills and L.G. Rudstam (Cornell Biological Field Station). R/CE-9

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David B. MacNeill
Three-panel brochure. $1.00.

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Gillian E. Earnest
Guidebook. 32 pages (plus figures and tables). $1.00.

Municipal Nonpoint Source Pollution Guidebook
J. Pultz and R. Williams
Guidebook. 45 pages. $2.50.

The Ontario Dune Coalition 10th Anniversary Report
Dave White
Report. 4 pages. $1.00.

New York's 1993 Bed and Breakfast and Inn Industry
Diane Kuehn
10 pages. $1.00.

Aquaculture Marketing Survey
Ken Gall and Linda O'Dierno
109 pages. $10.00.

Zebra Mussels in the Hudson: A Guide for Educators
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4 pages. $1.00.

Scenic Byways, Trails, and Corridors and Their Impacts
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Marine Science at Work- Case Studies and Youth Action Plans
Robert J. Kent and H. David Greene
24 pages. $6.00. Available from Media Services, 7 Cornell Business & Technology Park, Cornell University, Ithaca, New York, 14850.

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David B. MacNeill
12 pages. $1.00.

Selected Boat Ramps in the Marine Waters of Nassau and Suffolk Counties: Summer Use Characteristics
Mark H. Malchoff
18 pages. $1.00.

Our Lake Ontario Sand Dunes: A Resource Notebook.
David G. White and W.-Dieter N. Busch. 23 pages. $10.00.

Aquatic Plants - Another World
H. David Greene and Michael W. Duttweiler
12 pages. $3.50.

A Manual for Nonlethal Surgical Procedures to Obtain Tissue Samples for Use in Fish Health Inspections
G.A. Wooster, H.-M. Hsu and P.R. Bowser
27 pages. $1.00.

Development of a Directory of Boater Pumpout Facilities and an Assessment of Pumpout Operations and Use in New York and Connecticut Marine Waters
Jay Tanski
37 pages (plus appendices). $2.00.

Journal Reprints

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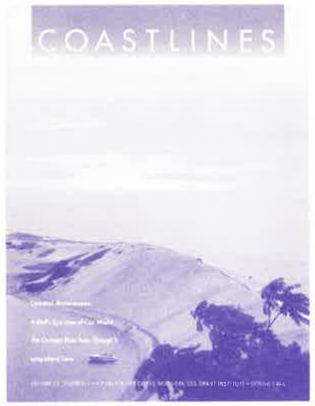
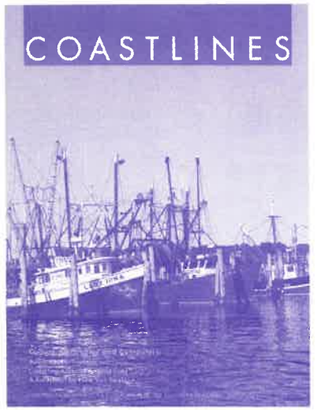
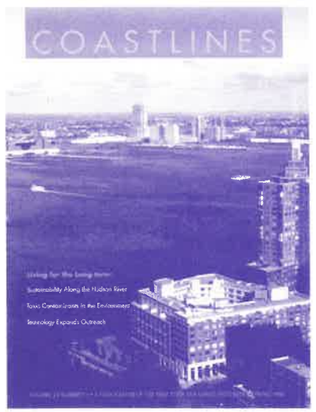






A Smoked Salmon for Your Thoughts . . .

In 1994, New York Sea Grant staff launched an ambitious effort to transform COASTLINES to a flagship magazine that reaches 7,000 readers across New York state, the U.S., and overseas.

COASTLINES was initiated in 1971 as a communications link between the newly developing New York Sea Grant program and potential researchers, campus administrators, and the public. After 23 years of publishing COASTLINES as an eight-page newsletter, staff said they wanted a newsletter with greater visual and editorial appeal that would intensify awareness, interest, and support in Sea Grant research and outreach.

The first issue of the four-color cover, magazine-format COASTLINES was printed in 1994. Since its inception, six issues of COASTLINES have gone to press focusing on a variety of issues such as aquatic biotechnology, New York's recreational fishery, long-term ecosystem sustainability, and coastal stewardship. COASTLINES draws both a general and technical audience including coastal residents, teachers, public officials, members of marine and Great Lakes businesses, as well as university researchers and staff. To expand COASTLINES' profile at the same time, the readership was doubled from 3,500 to more than 6,500 people. Additional copies of the magazine are distributed at scientific workshops and other coastal-related events.

Cornell University's Office of Communication Strategies (CommStrat) was retained by New York Sea Grant in 1995 to help survey readers of the winter issue (Vol. 25 No. 3) to determine whether readers value COASTLINES' current format and editorial content. A survey consisting of 16 questions that allowed respondents to share concerns and offer suggestions was mailed to 500 COASTLINES readers selected by Sea Grant from the Lab's database using a stratifed random sampling technique. In addition to the mail survey, a short business reply card inserted in the publication, afforded every reader the opportunity to provide feedback.

A total of 111 readers responded to the lengthier survey within the three week deadline, representing a 22.2 percent response rate. An additional 360 business reply cards were also returned in that period representing a six percent response rate—one in 16 readers—a rate double the average such an approach draws, according to CommStrat.

The readership is highly engaged. Here's a summary of CommStrat's Interim Report of Findings. Of those responding to the mail survey, 89 percent say they find the contents interesting and the same number agree the information is useful. Asked to suggest a specific story topic, 69 readers—62 percent of those responding—cited at least one. Nearly 80 percent of respondents agree that COASTLINES has increased their awareness of Sea Grant, 87 percent say the publication is well-written, and 31 percent recall ordering at least one Sea Grant publication as a result of reading about it in COASTLINES. A segment of the readership would like to see a more graphic publication—while 79 percent say they like the readability of the layout, only 61 percent believe there are enough photos and 68 percent find the artwork appealing. COASTLINES readers are well-educated (81 percent have at least a bachelor's degree, 26 percent a doctorate), and mature (85 percent are over 35 and 56 percent are over 45.) Seventy-one percent of respondents say they read the magazine regularly and 23 percent say they read it sometimes. The "Coastwatch" section of the publication is the most widely read, with 65 percent of respondents saying they read it regularly. Other sections include "Features" (59 percent), "Currents" (53 percent), and "Publications" (51 percent). Asked to suggest changes, 43 percent listed at least one, but 38 percent offered no suggestions, and an additional 19 percent said they would not change a thing about COASTLINES, some rather emphatically.

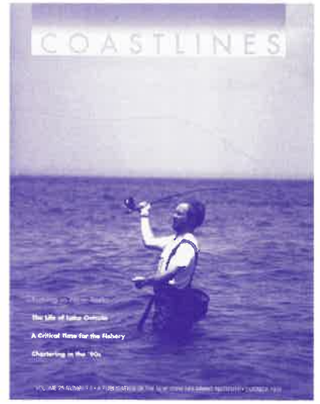
COASTLINES is reaching more than its 6,500 initial recipients—85 percent of readers say they pass it along, 40 percent frequently.

Respondents express high levels of satisfaction with the magazine. Nearly half (48 percent) say they are satisfied and 29 percent say they are very satisfied. Only four out of 111 respondents to the survey express overall dissatisfaction with the publication. Though all were given the chance to cancel their subscription, only four requested cancellation.

Asked to rate their impression of the length of most articles, 83 percent of respondents say they are just right. Nearly 90 percent of respondents agree that COASTLINES information is useful and 47 percent—probably a high number for such an influential audience—say COASTLINES has influenced their opinion.

Of the 360 respondents to the business reply card, 335 (94 percent) say they have a positive or very positive impression of COASTLINES. Another 19 (5 percent) say they have a neutral impression. Thirty-nine percent of the respondents say they are likely to read all of the publication, another 46 percent say they are likely to read most of it.

The editors of COASTLINES appreciate all the feedback they received from readers for the survey. The information will be very helpful in developing future issues of the publication. While John Santacrose of the Audubon Society and Peter Boody at the Southampton Press were the lucky winners of the clam bake and smoked salmon respectively, all our readers are winners! Please continue to send us your comments.



SEAFOOD CORNER

Lobsters are one of the most important seafood products harvested in New York both in terms of the total value of lobsters landed, and the number of commercial fishermen who make their living in the lobster fishery. Lobster ranked second for most of the past decade in terms of total ex-vessel value of all seafood products landed in the state, exceeded only by the hard clam.

Lobster harvesting has been a Long Island tradition since colonial times. They are caught with essentially the same gear used for decades, the lobster pot. Today lobsters are considered one of the most successfully managed of our local marine resources.

Record lobster catches have been recorded in New York over the past several years for a variety of reasons that probably include a natural upswing in the population, increasing fishing effort, and successful management strategies. Resource management strategies for lobster have utilized our understanding of the lobster's life cycle. Current harvest size limits insure that lobsters have the opportunity to reproduce at least once and possibly twice before they reach harvestable size. This is important to insure a stable and healthy resource.

Lobsters are nocturnal animals that avoid sunlight. In shallow waters they seek out crevices in the rocks to spend the daylight hours. Lobsters feed on sedentary and slow moving creatures like mussels, clams, sea urchins, starfish, worms and crabs and even catch small fish. With such a delicately flavored diet it's no wonder that lobster meat is so sweet and tender.

Lobster Imperial

Jimmy King, Long Island Sound Lobstermen's Association

4 lobsters - 1 1/4 pounds
1/2 green pepper, finely chopped
1 pimiento, finely chopped
1 egg
1/2 cup mayonnaise
1 tblsp. bread crumbs
1 tsp. English mustard
1 tsp. paprika
1 tblsp. additional mayonnaise

Boil lobsters* and allow to cool. Split lobsters in half and pick out the meat in the tail, body, and claws. Thoroughly clean the body and tail halves, rinse and save. Cut lobster meat into 1/2 inch (bite size cubes.)

In a bowl, combine green pepper, bread crumbs, pimiento, egg, mustard and 1/2 cup mayonnaise. Mix well, Add lobster meat and mix gently. Spoon mixture into cleaned lobster shells. Spread additional mayonnaise on top and sprinkle with paprika. Bake at 350 degrees for 15-20 minutes. Serve hot for an elegant meal, garnished with lemon and parsley. To serve cold, chill the baked lobster halves in the refrigerator and serve on a bed of lettuce.

Nutritional Information
(for 3 ounces of boiled lobster)*

Calories:	96
Protein:	20 grams
Total Fat:	0.9 grams
Saturated Fat:	0.1 grams
Omega-3s:	0.2 grams
Sodium:	323 milligrams
Cholesterol:	101 milligrams

*Source: Seafood Savvy, Ken Gall, Cornell Cooperative Extension Information Bulletin, 1992.

*Boiling Lobsters

Fill a large kettle three-quarters full of salted water, allowing 2 1/2 quarts per lobster. Bring the water to a boil and put the live lobsters in one at a time, head first. Cover and simmer 5 minutes for the first pound, 3 minutes for each additional pound.

Sea Grant
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