

Taking Initiative

Taking an initial dive into uncharted waters — a story that began 30 years ago for New York Sea Grant.

“

With our first year of Sea Grant **initiated**, we must begin to work very hard towards producing results of value to the state and to the program. For the New York State Sea Grant Program to grow and prosper, all of its **initial** participants, as well as those who will be joining the program in the future, will have to give their best creative thinking toward the problems of restoring the

quality of the state's coastal waters, developing their resources, and planning better utilization of our coast for the citizens of the state. With award of the **first** year grant, the burden is upon us to show that we can live up to the expectations.”

—Dr. Donald Squires, New York Sea Grant's first Director, 1971

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From the Director

This issue of *Coastlines* might be characterized as "New York Sea Grant — How we set our course."

Articles span the time frame from summaries of the first issue of *Coastlines* in 1971 through the Lobster Initiative that received recent national office approval and will run for two to three years beginning June 1, 2001. There are consistencies of high quality that stretch through the whole existence of NYSG from the rapid attainment of Sea Grant College status in 1975 through the program rating of "excellent" by the national office in early 2001. As I promised in the *Winter 2001* issue, this second of the 30th Anniversary issues of *Coastlines* will highlight two more Coordinated Issue Areas: New Initiatives and Fostering Coastal Businesses. Both were used to demonstrate New York Sea Grant's integration of research and outreach to serve its coastal stakeholders.

The New Initiatives Issue Area is really a "catch-all" goal in our strategic plan; we use it to take advantage of opportunities for partnering with other organizations aimed at responding in a timely fashion to rapidly-emerging — some might say emergency — coastal resource issues.

Three such initiatives are highlighted. The longest running — the fifth year of six will end this fall — is focused on

brown tide. Clearly, the research and outreach have increased our knowledge of the key influences on initiation and cessation of the algal blooms. The hard clam initiative work began under the watchful eyes of an advisory committee toward the end of 2000, and syntheses of results will take place in 2003. Results from the lobster initiative (NYSG's projects are summarized on page 14) lie even more in the future. Each of these initiatives is a good example of NYSG working together with other groups to leverage funds.

The article on *Fostering Coastal Businesses* highlights ways in which NYSG serves small businesses. Activities have run the gamut from research on diving physiology and development of underwater parks, through extension of information to aid businesses with narrow profit margins to control pollution, to new directions in tourism, and understanding recreational resource use conflicts.

Other articles focused on the sponsorship of meetings on avian botulism in Lake Erie and marine education. The former is a new issue and we collaborated with Pennsylvania Sea Grant to fund the meeting. Finally, what could be a better time than summer to enjoy lobster, hot or cold.

Hope you enjoy the issue(s).




Another new beginning . . . A marine educator on a field trip holds a herring gull chick emerging from its egg on "Bird Island" in Shinnecock Bay. See the story about NYSG participation in an educators' conference on page 12.

Photo by Lou Siegel

The very first **Coastlines** *of December 1971...*

reported that about a month before, the New York Sea Grant Program was formally launched at a presentation ceremony in then-Governor Nelson A. Rockefeller's office in New York City.

As we continue the celebration of New York Sea Grant's 30 years of service, here are some of the firsts of our early years gleaned from our Coastlines archives:

The **FIRST** multi-campus Sea Grant program sponsored by both the State University of New York and Cornell University.

The **FIRST** Sea Grant program to involve both marine and Great Lakes research.

With one of the largest single **FIRST** year awards, the program was funded at \$967,935 to support research, extension, and education along NY's many coasts.

In 1972, **Bruce T. Wilkins**, of Cornell's Department of Natural Resources, was appointed the **FIRST** Program Leader for NYSG's Advisory Services – what we now call Extension.

The **FIRST** NYSG annual report described some successes of that **FIRST** year which had emphasized resource development and management:

- research on thermal emissions of Lake Ontario's power plants
- studies on Lake Erie that helped extend the lake's navigational season
- suggestions for reducing the pollution of Long Island Sound from the East River
- documentation of the importance of NY's commercial fishery

The **INITIAL** extension issues and stakeholder groups began to take shape. In the Great Lakes: technology transfer to water resource planners, the angling community, and marina and other recreational developers. In the marine district: increasing protection in estuarine areas, improving incomes of full-time commercial fishermen through better use of equipment, developing cost control for charter fishing captains, and achieving efficiencies in shellfish processing plants.

In 1973, marine extension specialist **Dale Baker** (pictured left) **FIRST** opened the doors to the NYSG office on the SUNY Oswego campus where he developed programs in environmental impact statements and power plant siting—issues of keen interest to NY businesses and communities in the seventies. Baker is currently NYSG Associate Director and Extension program leader.

The formation of the New York Sea Grant Institute in late 1974 expanded the scope of research by bringing in other private and public colleges for the **FIRST** time.

In May 1975, the Secretary of Commerce made the **INITIAL** announcement that "New York's strong program of sustained excellence qualifies it for the honor of Sea Grant College status." New York was the eighth state so designated out of the 26 coastal states with programs at that time.



**NYSG Associate Director
Dale Baker circa 1973.**

As we flash forward to this current *Coastlines*, we invite you to read about one of our issue areas of long-standing, **fostering coastal businesses**, and to take note of some of our **new initiatives** on the following pages.

— **Barbara A. Branca**

New Initiatives



Some of the many recreational uses of Long Island's Great South Bay. Under the water's surface, New York Sea Grant initiatives include hard clam research and brown tide research and education. Brown tide is one of several agents that has affected the bay in the last decade or so.

Photo by Barbara Branca

Three efforts are currently underway in which New York Sea Grant (NYSG) has been successful in bringing significant external financial resources to bear on critical and newly-developing environmental issues. "While each is in a different stage of implementation," explains NYSG Assistant Director **Cornelia Schlenk**, "the stories of their evolution serve to illustrate the groundwork, methods, and networks our program utilizes to make these new initiatives a reality." **Brown tide** efforts are now in their fifth year of special funding (see pages 6-7 for the latest findings), research selected under a **hard clam initiative** is in its first field season, and a **lobster mortality/shell disease program** has just started. "We have established an effective method in our approach and management of such initiatives that is becoming well-recognized as a successful model," says Schlenk. "These initiatives demonstrate that NYSG responds to emerging questions and stimulates others to do so as well."

Shoring Up Support for Hard Clams

Two Decades of Hard Clam Support

After funding a suite of milestone hard clam-related projects in the early 1980s, NYSG continued to support single projects as part of its core research program. In addition, the decline of the south shore's hard clam industry was one of the driving factors behind the creation of a state-supported effort similar to EPA's National Estuary Program. In 1993, the South Shore Estuary Reserve (SSER) was established to develop an overall, comprehensive management plan for the area, which included hard clam population maintenance. NYSG Assistant Director Cornelia Schlenk serves as chair of SSER's Technical Advisory Committee, as well as a member of its governing Council. Also, NYSG earmarked additional funds during 1998-1999 to support a pilot field study relating clam and oyster growth to phytoplankton composition and concentration.

Page 4 sidebar and article by Paul C. Focazio and Cornelia Schlenk

Hard clams— including such market sellers as chowders, cherrystones, and littlenecks (the smallest and most valuable of the bunch)— had been economic and ecological cornerstone of Long Island's South Shore Estuary area. Some 30 years ago, New York, with its Great South Bay considered "the world's richest clam factory," provided more than 60 percent of the nation's hard clams.

In 1976, landings of hard clams (*Mercenaria mercenaria*) hit an all-time record, totaling more than 700,000 bushels. But soon after, harvests started dropping. Around this time, hard clams first became an intensive topic of NYSG research and outreach. New York Sea Grant brought shellfish biologist **Robert Malouf** to New York on a Sea Grant professorship. During the 1980s, he, along with his colleagues and their many students, developed what Schlenk says "still stands as some of the best information we have about hard clam reproduction, predation, growth, and feeding."

To support its focus on the hard clam resource and industry, NYSG also funded and coordinated

a large set of studies of the Great South Bay in the early 1980s. These efforts culminated in, among other things, numerous journal articles and the production of the landmark *The Great South Bay* book. Landings continued to decline, however, and baymen gradually moved to other fisheries or left the water altogether.

While the 1980s' suite of NYSG-funded clam-related studies gave the industry and managers much-needed knowledge, continued declines in growth rate and recurring brown tides made it clear that a re-examination was essential. "A general assumption was that the hard clam's decline could be attributable to a number of factors, but some evidence suggested that the situation was changing further," says Schlenk.

Thanks to then-Congressman Mike Forbes' interest in the South Shore Estuary Reserve, in October 1999, NYSG announced that it would administer \$427,500 in funds from the Northeast Regional office of the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) for a new research initiative to investigate the population dynamics

www.seagrantsunysb.edu/HardClam/HardClamInitiative.htm

Lobster Mortalities and Shell Disease

In June 2001, the Long Island Sound Lobster Research Steering committee announced federal funding for 18 research projects that will improve what is known about the causes, extent, and persistence of conditions that led to die-offs and shell disease of the American lobster (*Homarus americanus*) in the Sound during 1999 and 2000. These research projects—most of which will start this summer and run two years—are jointly-funded under the \$3.5 million **Long Island Sound Lobster Initiative**, an endeavor of Sea Grant programs in New York and Connecticut along with the Connecticut Department of Environmental Protection (CT DEP).

Research will address the health and disease of lobsters and the influence of environmental stressors, including temperature and toxic contaminants such as pesticides on lobster mortality and shell disease. “This effort promises to be an excellent example of federal-state collaboration,” says Mattice. “The initiative’s research projects should provide evidence to select among the many potential causes of the lobster mortalities and sickness.”

Federal monies for the Sea Grant projects (six each by the NY and CT programs) are funneled to the Sea Grant

programs via National Marine Fisheries Service, which will conduct three projects of its own with the federal dollars. Connecticut Governor Rowland made \$1 million in funding available for three additional CT DEP projects. CT DEP and NYS DEC each are receiving 1.3 million federal dollars for monitoring in LIS. Other collaborators include representatives of Long Island Sound lobster fishers’ organizations and the US Environmental Protection Agency.



Both the New York and Connecticut Sea Grant programs will use some of the lobster allocation to keep the lobster fishers, resource managers and the public informed about how the research is progressing. “Research is a dynamic and collaborative effort,” says

NYSG lobster outreach specialist **Antoinette Clemetson**, “and the program’s success depends on the lobster fishing community’s willingness to cooperate with our scientists and vice-versa.” Clemetson’s role will be to keep the lines of communication open between the scientists and the stakeholders through a series of newsletter updates, workshops and other outreach techniques coordinated with Connecticut Sea Grant.

(Continued on page 14)

This enameled metal lobster sculpture, on display in Southampton this spring, was done by student Greg Lesiewicz, son of a long-time Long Island lobsterman.

of hard clams in Long Island’s south shore estuary. “This targeted allocation of federal dollars for hard clam research could not have come at a better time,” says Schlenk. In December 1999, \$50,000 was added to the initiative’s pot for research by the Port Authority of New York and New Jersey, which was also supporting a hard clam stock assessment on the New Jersey side of Raritan Bay (part of the lower New York Harbor). New York Sea Grant contributed an additional \$100,000 and \$50,000 is anticipated for the SSER.

Three research teams, two of which are led by investigators from outside New York, have recently begun two-year projects.

Roger Newell of the University of Maryland Horn Point Lab has teamed up with Southampton College’s **Stephen Tettelbach** in an effort to determine if reproductive cycles of adult hard clams in Long Island’s south shore bays are still synchronized to normal patterns of primary production. If conditions are shown not to be optimal, the use of hatchery seed-clam production for restocking the bays may be advised as a short- to medium-term management strategy.

A research team at Stony Brook University—including **Robert Cerrato, Glen Lopez, Darcy Lonsdale, Roger Flood, Robert Armstrong** and **Jeffrey Levinton**—will examine the trophic interaction between hard clams and phytoplankton. In effect, the team is testing the idea that that “the reduction in clam abundance may have propelled its population and associated ecosystem into a state where the scope for its growth has been reduced.” Further, the clam’s steady declines in abundance in different habitats suggest one or more widespread or chronic causes.

Identifying the controlling factors related to hard clam growth, survival and environmental interactions will be the goal of the third and final research endeavor, to be headed by **Eileen Hoffman** of the Center for Coastal Physical Oceanography at Old Dominion University, Norfolk, Virginia. The multi-institutional team’s project summary states, “The primary objective of this effort is to develop a population growth model for the hard clam. This model will permit evaluation of the potential effects of changes in biological and environmental components of the Great South Bay system on the resident hard clam population levels and production.”

Why Does Brown Tide Thrive in Local Waters?

“*The questions we’re asking today are very different from the ones we were asking 15 years ago. We’ve come a long way.*” —Dr. Gregory Boyer, SUNY College of Environmental Science and Forestry

And so began the NYSG-sponsored **Brown Tide Research Initiative public symposium** held at Southampton College of Long Island University where investigators described what is currently known about brown tide. “Solving the brown tide mystery and finding ways to manage the bloom and its impacts are crucial to Suffolk County’s environment, economy, and quality of life,” said Suffolk County Executive **Robert J. Gaffney** in a statement prior to the event. “I commend NOAA, New York Sea Grant, and the Brown Tide Research Initiative consortium for their commitments to brown tide research.”

During the symposium, BTRI and other regional brown tide researchers explained how findings are building a more complex picture of brown tide. Combinations of factors may stimulate growth or, conversely, cause the demise of the microscopic alga responsible for brown tide blooms, *Aureococcus anophagefferens*.

Photo by Barbara Branca



Several of the many brown tide scientists who presented this spring are, from left to right, Christopher Gobler, Ed Thier, Robert Nuzzi, Charles O'Kelly, Darcy Lonsdale and Todd M. Kana.

Christopher Gobler, Assistant Professor of Marine Science at Southampton College, outlined several hypotheses his field research addresses. “My studies deal with a new approach that simultaneously evaluates the role of processes that can

enhance brown tide growth rates, such as the use of nutrients, and those that remove brown tide cells, such as microzooplankton grazing,” said Gobler. “My results have characterized an ecological niche in which high levels of organic nutrients and low microzooplankton grazing on brown tide contribute to the flourishing of blooms in the bay.”

BTRI researcher **Todd Kana**, from the University of Maryland’s Horn Point Environmental Laboratories, added, “Brown tide is suspected of being stimulated by nutrients released from the sediments. And, in the shallow bays of Long Island, there is the potential for bottom-dwelling organisms and microorganisms to affect the availability of nutrients to the phytoplankton.”

Additional hypotheses as to why *Aureococcus* thrives or dies include growth stimulation by iron, which, although it appears not to be vital to bloom initiation, may be important in bloom maintenance. Also, research has shown that physical characteristics – such as decreased rainfall prior to a bloom, reduced bay flushing or higher salinity – are not solely the causes for such bloom formations as the 1985 event in Narragansett Bay.

Significant advances have resulted from the work of several investigators funded by Suffolk County Department of Health Services (SCDHS). **Julie La Roche**, working at Kiel University in Germany, successfully established bacteria-free, or axenic, cultures of *Aureococcus anophagefferens*. Collaborating with **Robert Andersen** of Bigelow Laboratory of Ocean Science, the axenic *Aureococcus* cultures have been deposited at the Provasoli-Guillard National Center for Culture of Marine Phytoplankton and are available for use by other investigators. Said NYSG’s BTRI outreach specialist **Patrick Dooley**, “The establishment of these cultures is an important step in understanding the complexities of brown tide because researchers will now be better equipped to conduct the most informative of experiments, particularly those relative to *Aureococcus*’ nutritional and growth requirements.”



Sea Grant scholar Dianne Greenfield shows seawater containing brown tide taken from Sayville in the Great South Bay in the summer of 2000.

Other results from the BTRI network of investigators include the availability of 17 *Aureococcus* strains for experimental study, the establishment of laboratory growth conditions, and the detection of no genetic differences among *Aureococcus* strains on the population level.

Research investigating different aspects of brown tide has been ongoing since the algae's first appearance in 1985 in New York and other nearby waters. Since then, *Aureococcus* has been identified from Portsmouth, New Hampshire to Virginia, including Maryland's Chesapeake Bay. Brown tide is not just a northeastern United States phenomenon as an "in press" scientific report (for which SCDHS's **Robert Nuzzi** is a contributing author) documents the presence of *Aureococcus* in Saldanha Bay, South Africa.

Episodic blooms have been detrimental to the Peconic Estuary bay scallop industry, with potential impacts to eelgrass beds. Added Boyer, "Although brown tides do not appear to pose a health threat to humans, its presence may have negative impacts on recreational fishing, boating and swimming."

And why are there still so many questions, concerns and hypotheses since the 1985 brown tide bloom in Long Island? One of the main reasons is, as Kana explained at the symposium, "Brown tide is very intermittent, which can make it difficult to study." Research has

answered many of the early questions, but also revealed that the problem was more complex than expected.

Studies by brown tide researcher **Darcy Lonsdale**, from Stony Brook University's Marine Sciences Research Center, have found the presence of hard clams in mesocosm studies – those using 300-gallon plastic tanks to simulate conditions of shallow bays – could prevent the growth of brown tide due to their feeding activities.

Representatives from **Michael Sieracki's** group at Maine's Bigelow Laboratory for Ocean Studies presented several "take-home points" at the symposium, including the opening of a niche for small algae in the spring that can be filled by brown tide and the fact that organic nutrients may favor brown tide. This, in addition to discovering the existence of a mutual relationship between brown tide and a marine bacterium, may assist in the persistence of *Aureococcus*.

Partnerships remain a key factor in efforts to better understanding why *Aureococcus* thrives in local waters. "We are optimistic that, through working together, we will find the causes of the bloom's onset, persistence, and cessation. This will allow us to develop ways to manage the bloom and its effects," said Gaffney. At the close of the symposium, NYSG Assistant Director **Cornelia Schlenk** emphasized the importance of providing opportunities for researchers to discuss their findings and develop synergistic collaborations. "Maintaining an outreach component to keep managers and all interested parties informed about the ongoing research is also critical, especially as brown tide is a factor in the Comprehensive Management Plans of both the South Shore Estuary Reserve and the Peconic Estuary Program."

Brown Tide Back Story

A variety of sponsors provided funding for brown tide studies in the early nineties, including New York Sea Grant, Suffolk County, the New York State Department of Environmental Conservation, Stony Brook University's Marine Sciences Research Center, the Environmental Protection Agency, Peconic Estuary Program, Brookhaven National Laboratory, and Southampton College. In 1995, a brown tide summit was convened to assess the state of knowledge and formulate research recommendations. Then in 1996 the BTRI program was launched in 1996 by the National Oceanic and Atmospheric Administration's (NOAA) Coastal Ocean Program, BTRI is now a 6-year, \$3 million NYSG-managed program. It brings together numerous investigators, organizations and institutions to coordinate research and outreach efforts aimed at determining the physical, chemical and biological factors that cause, sustain and lead to the demise of *Aureococcus* blooms.

Sidebar and article by
Paul C. Focazio

Photo by Barbara Branca



Dr. Gregory Boyer (left) discussing brown tide with NYSG's Patrick Dooley who coordinated the symposium.

Diving to Great Depths

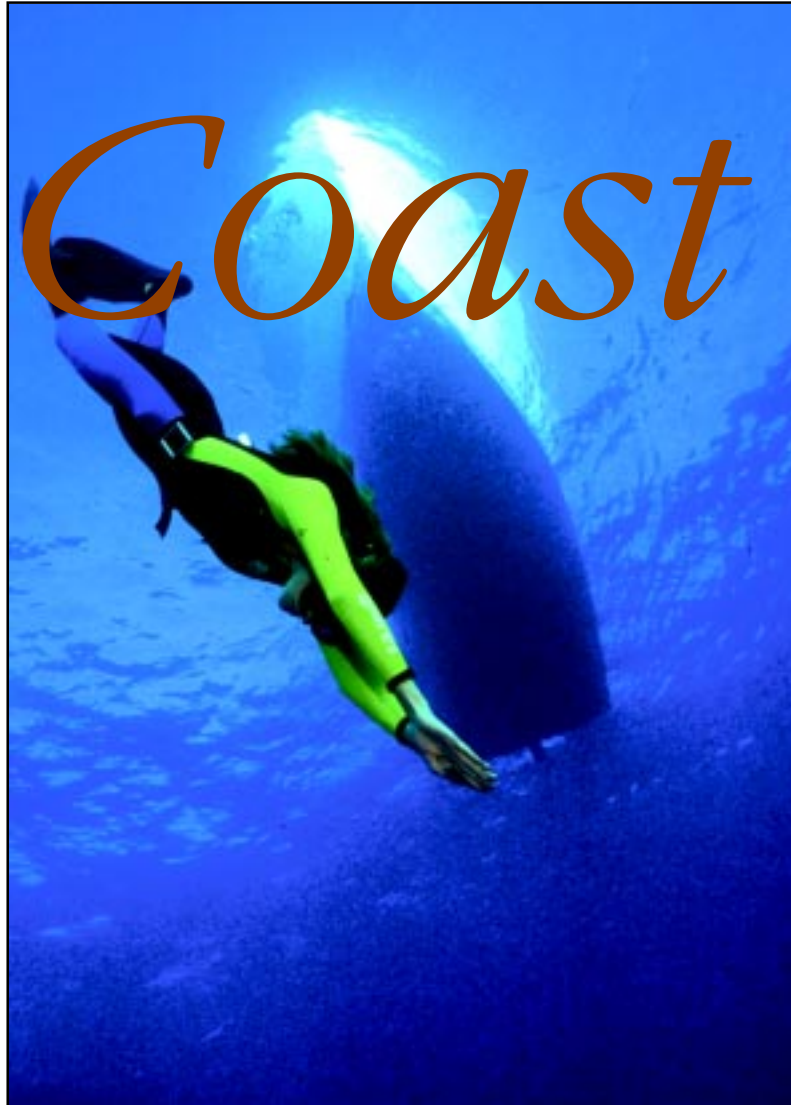
If you're interested in how the body reacts to severe stress, whether it be encountered at great depths, high altitude or heavy exercise, researcher **Claes Lundgren** says, "It is useful to push the body to its limits. These conditions allow you to look at how the body reacts as if it were under a magnifying glass." Lundgren is Director of the Center for Research and Education in Special Environments (CRESE) at SUNY Buffalo, which is set up to determine how the human body copes with extreme conditions.

Under the magnifying glass in Lundgren's studies is "the diving response," a universal reaction shared by all mammals to going underwater. And Lundgren's studies – including seven New York Sea Grant-funded projects since the early-1980s – provide new data to better understand how humans and other mammals sharing this deep diving mechanism react to underwater conditions.

Says Lundgren, "It's important to have a scientifically grounded understanding of the physiology of breath-hold diving. This knowledge is vital for recommending safe swimming and diving practices, training of both breathing and breath-hold divers, and the diagnosis and treatment of diving and near-drowning accident cases."

In the early 1990s, Lundgren headed a NYSG-funded investigation on the physiology of the diving response in male and female expert divers. Utilizing a state-of-the art hyperbaric chamber, where pressure can be increased to simulate great depths, his team examined the slowing of the heart, blood distribution, and gas uptake and exchange dynamics. Findings supported the idea that, especially in cold water, people with cardiovascular ailments have a greater risk of potentially serious circulatory disturbances if engaged in diving.

The practical results from Lundgren's breath-hold diving project peaked the interest of PBS's "Scientific American Frontiers"



With her training boat overhead, Meghan dives in for a practice run in 1997. Learn more about her diving experiences at www.freediver.com.

Photo by Mark Rackley

series in 1990 and Turner Broadcasting System's "Ripley's Believe it or Not!" in 2000. In the "Ripley's" segment, which also featured free-diver **Mehgan Heaney-Grier**, Lundgren offered his expertise on the topic of deep sea diving.

Caution Down Below

According to Lundgren, a professor of physiology and biophysics, "the diving response" kicks in when the diver starts to breath-hold and water cools the face as he or she glides further down into the depths of the ocean. Exposure to excessive depths, though, can cause a collapse of the lungs, cardiac arrest, blackouts, decompression sickness and, at worst, death.

Decompression sickness (DCS) can affect divers of all types – SCUBA and breath-hold, recreational and commercial – severely disabling them or causing death. DCS occurs when inert gas bubbles, usually nitrogen, accumulate in the body as a result of improper decompression during ascent. Utilizing

Watch

a hyperbaric chamber, Lundgren and his investigators conducted three NYSG-funded DCS research projects. The team examined methods of reducing the potential for decompression sickness by examining modifications of its effects on the human circulation.

Among the findings, breathing pure oxygen during decompression at the lowest possible ambient pressure was shown to reduce sickness-related symptoms. Also, the pharmacological agents, *Terbutalin* and *Isoproterenol*, were identified as possibly allowing faster decompression.

But if Meghan let all the “what ifs” intimidate her, she may not have made it to such great depths with her breath-hold diving. On October 21, 1996, before boatloads of press, family and friends, Meghan dove to 155 feet, more than half the length of a football field. Ten months later, she swam past her own record, reaching 165 feet below the surface. During her tests of human endurance, Meghan holds her breath for minutes at a time underwater. So how is she able to stay below the surface for over four and a half minutes? As Lundgren explains, when trained divers such as Meghan hold their breath, their oxygen consumption goes down, allowing them to be submerged for longer periods of time.

Practice or a Pre-determined Power?

The skill behind deep diving has more to do with training and technique than it does genetics. Lundgren cites that there are a number of factors that may make the diving response more effective, including underwater laps, actual free diving, and

apnea training –activities done in a state of breath-hold, such as immersion of the face in cold water. “What happens in the training period is that the defensive protective mechanisms develop and become increasingly better,” he says.

Before each dive into the depths, Meghan says, “everything you do should be carried out in a very relaxed state.” So once she engages in a period of reflection and breathing, she’s ready to take the plunge. At 30 feet below, Meghan’s body loses its natural buoyancy. She stops kicking and begins to plummet through the sea. “You’re sinking like a stone, but you still have that weightless feeling, like you’re free-falling,” she says. As she goes deeper, pressure begins to build on her head and body. Her internal organs contract, and her eardrums bend inward.

If Meghan chooses the wrong spot to turn around, she’ll be faced with dangers such as shallow water blackout. And if she does run out of oxygen before surfacing and passes out, it can be deadly. “There’s no room for hesitation and panic, though” she says. “Fear and hesitation are natural feelings, there is no room for that with free-diving so you have to just set those feelings aside.”

So now that Meghan has gone to such great depths, what’s next? She does have her sights set on another dive, but she’s currently trying to catch her breath. Her hope of reaching a depth of 200 feet, equivalent to diving off a 20-story building, is on the horizon, though. “I like the challenge that variety can bring, but the free diving brings me back to a simpler state, even though it’s quite complex. I’m drawn to the idea of challenging both my physical and mental ability. For me, it’s a good obsession.”

– Paul C. Focazio

Flanked by two safety divers with scuba gear, Patricia Maiorca, a Sicilian breath-hold diver, ascends from a deep dive. The 1996 dive, which took place in the Mediterranean off Sicily, was part of a research study headed by NYSG-funded researcher Claes Lundgren.

Photos by Tommaso Nobili



Meghan is on her way to a depth of 165 feet (50.3m) in August 1997 (left). Although Meghan has broken her previous record of 155 feet (47.2m) in October 1996 (top), it is six-time champion Tanya Streeter who holds the women’s world record for

an unassisted dive at 220 feet (67m). Streeter’s Web site, <www.redefineyourlimits.com>, features an updated list of record breakers according to the International Association for the Development of Apnea’s (AIDA) various diving disciplines.

Photos by Jim Edds

Maiorca prepares for a deep breath-hold dive in the wet compartment in the CRESE lab’s pressure chamber. Dr. Massimo Ferrigno (in foreground) assists her with the experimental set-up, recording heart rate and blood flow. A successful dive requires a lower heart rate, a reduction of the carbon dioxide levels in the diver’s body, and ample room for additional reserves for air.



New Directions in Tourism

Coastal businesses of the ten counties that border NY's Great Lakes are looking for alternative marketing strategies to increase the number of visitors traveling to the region. "New program efforts becoming more popular in the region include agritourism, ecotourism and nature-based tourism," says NYSG coastal tourism specialist Diane Kuehn, who has taught a course on ecotourism and interpretation at SUNY CESF.

Ecotourism is on the increase in the unique sand dunes area on the eastern-most shore of Lake Ontario where dunes rise to a height second only to those of Cape Cod on the east coast. The dunes protect wetlands from the lake's wave action and form a unique ecological system. So how can tourism grow while preserving this unique ecosystem? One popular site had 30,000 visitors in 2000. So in 2001 the DEC partnered with NYSG and the Nature Conservancy to fund a student internship program focusing on preserving the 17 mile strip of rare dunes. Supervised by NYSG's dune habitat coordinator, Molly A. Thompson, the interns are providing visitor education on the preservation of sand dunes in several sites. The interns lead field trips for residents and tourists on marked trails while also collecting data to be used to interpret the health of the dunes and success of protection efforts.

Coordinated Issue Area

Fostering Coastal Businesses

Whether to a boat builder, marina operator, or a dive shop owner along the state's marine or freshwater shores, New York Sea Grant has provided information essential to coastal businesses since its 1971 inception. In the most recent decade, NYSG's efforts have been to help businesses maintain their competitiveness in the face of new regulations and requirements aimed at reducing environmental impacts. And in the last couple of years, NYSG has helped some coastal entrepreneurs in design approaches to enhance their businesses in the newest area of coastal tourism — ecotourism.

Under the broad heading of economic leadership, New York Sea Grant's research and outreach efforts focus on three related areas: marine business operation and management, recreation/tourism planning and development, and underwater resource management. By funding state-of-the-art research, compiling existing data, and producing diverse publications, NYSG is able to effectively communicate needed information to water-dependent businesses and other stakeholders.

Marine Business Operation and Management

With a diversity of coastal water resources found essentially nowhere else in the country, New York's salt, brackish and fresh waters provide the base for over 2,000 recreational marine-related businesses with more than 850 boat dealers, 32 boat builders and over 1,000 marinas that serve over 526,000 registered boaters in the state.

Public and private boating facilities, such as marinas and boatyards, are an important part of the coastal recreation and tourism infrastructure and economy. These facilities provide access to the water for thousands of visitors and residents while generating billions of dollars to state and regional economies. The EPA's Long Island Sound Study found that recreational

boating is the single most important economic activity associated with the use of the Sound, generating several billion dollars annually. Economic studies of two other LI estuaries found that recreational boating facilities had the largest economic impact of any of the water-dependent uses in the region.

But while boating is a significant revenue generator in coastal areas, the marine facilities that provide the infrastructure necessary for this activity are typically relatively small businesses operating at very low profit margins— usually less than five percent. Because they are on the water, these facilities often have high overhead expenses associated with the high cost of waterfront property and specialized marina equipment and structures. Added to those expenses, marine recreational facilities must also meet some of the most rigorous environmental standards due to their waterfront location. Federal, state and local governments are implementing pollution control programs and regulations that may require many marine facilities to implement costly changes in facility design and operation. Improper implementation of proposed environmental requirements could drive smaller, less profitable enterprises out of business.

At the national level, Sea Grant professionals have identified the need for reliable, technically-sound information on the economic and environmental impacts associated with recreational boating and marinas in order to foster wise decision making. Sea Grant has recognized that government officials and decision makers need help in better understanding the needs and constraints of this industry and evaluating the effectiveness and cost of regulations and policies aimed at reducing pollution from marine facilities.

At the program level, NYSG professionals help recreational boating facility operators identify and implement pollution control measures in a cost-effective manner. NYSG specialist **Jay Tanski** worked with Coecles Harbor Marina and Boatyard to create a demonstration site for Best Management Practices (BMPs) for marina pollution control. The marina served as living classroom where marina operators were shown first-hand a variety of all practices that reduce and control pollution sources from marine facilities. Workshops allowed participants to observe the use of equipment, products and operational procedures to minimize pollution in a "real world" setting. Tanski reports that of the respondents to a workshop evaluation questionnaire, all had invested some money in pollution control measures. "The average expenditure was \$5,439. If this average is applied to the estimated number of marine facilities operators attending, the workshops may have helped account for over \$489,500

Photos by Jay Tanski



Marina operators are shown first-hand a variety of techniques from material handling to hull maintenance to storm water management.



A Hudson Valley marina.
Photo courtesy of Nordica Holochuck.

worth of pollution control practices being implemented in area marine facilities.”

Outreach tools developed on this project included an educational video, a slide set and a 16-page bulletin, *Storm Water Runoff Management*. According to Tanski, “In addition to being used statewide, 11 other states and two foreign countries have begun using these materials to train the marina industry. In Florida the bulletin has been distributed to every boatyard.”

Ed Kilgus, President of the Empire State Marine Trade Association (ESMTA) notes that “Sea Grant extension specialists Jay Tanski on Long Island and Dave White in the Great Lakes have been extremely cooperative, sharing their abilities and technical expertise.” Kilgus was instrumental in getting the law in place that mandates that marina operators stay up-to-date in the use of the most environmentally-safe bottom painting techniques. Bottom paint used on boats contains pesticide and operators must take courses and receive 10 credits toward pesticide application re-certification within 6 years. “With the logistic planning of the courses by White and Tanski, Sea Grant has served as an advisory arm in the re-certification program,” says Kilgus who has used the slide set as part of state-wide training for marine operators and distributed Tanski’s bulletin to all members.

In another collaboration with the ESMTA, as well as with the NYSDEC, NYSG conducted a thorough statewide inventory of the marina industry of New York State. Upon completion of the inventory, a desk reference was developed for agency use, including a New York State Marina Guide and web site made available to the public. With these two groups and other state and not-for-profit organizations, NYSG has produced numerous guides and fact sheets for boaters on pumpout facilities, boating and marina regulations, boating emergencies, the impacts of exotic species on boating, and boating access guides.

Not only is New York Sea Grant proactive in the transfer of vital technical information to marina owners and operators, Sea Grant is innovative in teaching the next generation of marina managers, planners and decision makers. NYSG Great Lakes program leader, **David White** says, “New York Sea Grant, in partnership with SUNY College of Agriculture and Technology at Morrisville, is continuing to look at the educational

needs of the state’s marine trade industry. Building on this strong partnership, Morrisville is the first upstate SUNY campus to offer course work directly focused on the needs of this industry.” Already several marina operators are employing new techniques resulting in cost savings and improved staff response as a result of this course.

New York Sea Grant-funded research is also essential for providing coastal businesses with up-to-date information. A cutting-edge study on personal watercraft completed by **Chad Dawson** of SUNY College of Environmental Science and Forestry in Syracuse, (see Summer '00 *Coastlines*) focused on identifying conflicts between water-based recreation user groups and recommending ways to resolve these conflicts. With an ever-increasing number of personal watercraft and boaters in New York waters, the continued enjoyment and safety of water-based recreation has become a crucial issue. The research results and recommendations from Dawson’s NYSG-funded study are currently being disseminated to stakeholder groups and managers through NYSG publications and workshops.

Underwater Resource Management

Another emerging area of interest, especially in the ten counties that border the Great Lakes, is that of use of our underwater resources. Spurred on in large part by the increase in water clarity brought on by the zebra mussel, there is increasing interest in gaining access to these resources and increasing their use by divers, historians and the general public. With interest on the rise, there is more of a need for definitive public policy for the long-term management of underwater resources.

The related businesses served by NYSG research and outreach activities in this issue area are dive charter operations, dive shop owners, dive clubs and other related businesses. To make an analysis of the SCUBA diving community and its economic impact in New York’s Great Lakes region, NYSG-funded research leader **Sharon L. Todd** of SUNY Cortland completed an in-depth survey in 2000. Todd’s study created benchmarks for the diving community’s impact in the region, identified the primary business motivation factors for dive business owners and surveyed dive preferences. The study results were presented at the *Great Lakes Underwater 2000* (See page 12,

“Growing” Businesses

Boaters, fishers, divers and other recreationists along New York’s many waterways may top off the day with a trip to another coastal business—a farm stand. NYSG’s Diane Kuehn’s 1999 study was the first to quantify the impact of agritourism on New York State’s economy—with a special look at the ten counties that border Lakes Ontario and Erie. Kuehn and co-author Duncan Hilchey (Cornell’s Farming Alternatives Program) present study results in “Agritourism in New York: Management and Operations.” This 8-page fact sheet identifies the types of agritourism businesses, and estimated income, expenses and profit by business type in each of NY’s tourism regions.

Kuehn says, “We found that 64 percent of the 645 farm-based businesses we surveyed plan to expand or diversify their operations in the next five years, while nearly seven percent say they may be out of business in that time.” Liability and liability insurance top the list of agritourism business owners’ concerns with marketing and labor costs, government regulations and taxes right behind. The pair is currently working on another fact sheet looking at agritourism marketing strategies.

Photo by Diane Kuehn



Farm stands like this one along Lake Ontario make up the greatest percentage of agritourism business types for 10 of the state’s 11 tourism regions.

Continued on page 14

Reeling in Results for School

This June, educators from around the state convened at Southampton College of Long Island University for the annual conference of the New York State Marine Educators Association. The three-day event centered around the theme of "Marine Science: Hooking Your Students on the Natural World." Says NYSG's Long Island Sound Study specialist, **Kimberly Zimmer**, treasurer for NYSMEA, "This concept is at the heart of an effort to more effectively infuse marine sciences into the state's and nation's educational curricula."

The conference featured a lecture by speaker and field trip leader **Dr. Stephen P. Leatherman**.

Leatherman is one of the world's foremost beach experts, a Florida International University in Miami professor, and author of 1998's America's Best Beaches. Also, attendees participated in workshops on whales, birds, turtles and fish and joined in on kayak trips, beach walks and boat surveys. The curricula activities included *Project Wet*, aquaria in schools, teaching marine science for the regents, and the EMPACT (Environmental Monitoring for Public Access and Community Tracking) program. Many local organizations involved in educa-

Photo by Lou Siegel, Oceanside High School



NYSMEA members and Southampton staff prepare a 36 foot trimaran, for a field trip out onto Shinnecock Bay.

tion exhibited their programs throughout the weekend, which concluded with a behind the scenes tour of Atlantis Aquarium in Riverhead. Says Zimmer, "It was a fun and exciting weekend filled with opportunities for educators to network and learn new activities to bring back to the classroom to excite students about the marine environment." For additional information on NYSMEA, log on to its web site, <members.aol.com/nysmea>.

— **Kimberly Zimmer**
Long Island Sound Outreach Coordinator

Making a Splash in Oswego

Oswego was again the scene on March 10th for *Great Lakes Underwater!* This, the fifth installment of the annual shipwreck symposium, was sponsored by New York Sea Grant and the Oswego Maritime Foundation. One of the many shipwrecks discussed at the event, held at SUNY Oswego, was *The Keystorm*, a freighter whose wreck lies on its side on a steep shoal, forever pointing its bow upward toward the sunlit surface of the St. Lawrence River.

Last May at Great Lakes Underwater IV, history was made on the evening news as the Syracuse-based ABC affiliate station WIXT NewsChannel 9 televised perhaps the first-ever live broadcast of an underwater ribbon-cutting. Twelve feet underwater, five divers helped dedicate the *David W. Mills Submerged Cultural Preserve and Dive Site* in Lake Ontario. According to NYSG's Great Lakes program coordinator **David White**, "The buoying and marking of this preserve

culminated nearly ten years of hard work and determination of many people involved in diving, historic preservation, community development, and education in the Oswego area and throughout the state."

According to **Phil Church**, OMF's Director of the Submerged Cultural Resource Program, "History buffs or anyone who enjoys true stories of adventure and exploration are drawn to this annual event for its professional presentations, exhibits and displays."

Great Lakes Underwater VI is already in the planning stages for next March. Potential topics include a discussion regarding the process for sinking ships and the *George T. Davie*, the newest shipwreck site off Kingston, Ontario.

— **Dave White**
Great Lakes Program Coordinator

Avian Botulism in Lake Erie

Sea Grant Responds

For birders, both novices and those with extensive life lists, the chance to see a common loon is exciting. Last fall, their excitement turned to disappointment as they found many of these beautiful birds washed up along the New York shore of Lake Erie. And loons weren't the only dead birds found – hundreds of mergansers, grebes, mallard ducks, ring-billed and herring gulls, and other dead waterfowl littered the shoreline. These birds were killed by **avian botulism**, a bacterial disease that can wipe out entire flocks of waterfowl. According to the New York State Department of Environmental Conservation, the agency in charge of collecting, counting and conducting pathology on the birds, more than 5,000 birds were impacted by the outbreak in 2000.

Avian botulism, a disease caused by *Clostridium botulinum*, has been recognized as a major cause of mortality in migratory birds since the 1900s. Although type C botulism has caused the die-off of thousands of waterfowl (especially ducks) across the western United States, type E botulism has been mainly restricted to fish-eating birds in the Great Lakes. Other outbreaks of type E have sporadically occurred in Alaska, Florida and California, and periodic outbreaks have occurred in Lake Michigan and Lake Huron over a 20-year period beginning in 1964. During 1999 and 2000, a large die-off of waterfowl occurred in Lake Erie and type E botulism was isolated in these outbreaks.

In response to the outbreaks, New York and Pennsylvania Sea Grant co-sponsored the first Lake Erie conference on avian botulism in Erie, Pennsylvania, on January 24-25, 2001. This conference brought together more than 60 researchers, fishery and wildlife biologists, resource managers and agency representatives. The goal of the workshop was to share findings from both the American and Canadian shores and develop a research agenda for future efforts. Organizers wanted to determine the extent of the botulism problem based on geography and

environmental conditions that existed during the outbreaks. During the second day of the conference, several breakout sessions were convened to address the research agenda questions that were posed to participants. Although organizers realized that the meeting was premature from a research data standpoint, they wanted to create a functioning network of scientists who could work together on research issues and respond to future outbreaks, if needed.

As a result of the workshop, response teams were developed for each state and Ontario, in case there are future botulism outbreaks. Several teams have been formed and research proposals are being developed to address research questions that came out of the conference. It is hoped the work and collaborations that began at the workshop will be able to answer some of the questions and fill in the information gaps surrounding this devastating problem.

— **Helen Domske**
NYSG Coastal Education Specialist

**Photo by Larry Smith, Conservation
Office, PA Game Commission**



**A dead gull and dead fish along
Lake Erie's shore, 2000. PA Sea
Grant's Eric Obert reports that
this sight has been common
during the summer of 2001, too.**

CURRENTS

Lobster Mortalities continued from page 5:

Summary of NYSG-funded Lobster Projects

LIS Lobster Initiative

“The research topics highlighted in our request for proposals are a direct result of the year 2000 meetings,” says NYSG Director Jack Mattice. In April 2000, over 250 lobstermen, researchers, resource managers, legislators of federal and state agencies as well as environmental organizations came together for the first annual LIS Lobster Health Symposium in Stamford, Connecticut.

The gathering in Connecticut – which featured experts who discussed some of the then-current hypotheses to explain the lobster die-off in the Sound – was succeeded by May 2000’s “Lobsters and the Long Island Sound: 1999-2000.” This meeting, at Stony Brook University, gave researchers and administrators an opportunity to discuss with lobstermen the research priorities that came from April’s symposium.

Page 14 sidebar and article by Paul C. Focazio and Barbara A. Branca

Robert E. Wilson, R. Lawrence Swanson and Duane E. Waliser, of Stony Brook University’s Marine Science Research Center (MSRC), will examine influence of water quality factors such as temperature, salinity, dissolved oxygen, and pollutants with respect to the lobster mortalities. Says Wilson of the generally hardy American lobster, “The lobsters are vulnerable to stress and sometimes mortality when exposed to unfavorable environmental conditions, especially during the molt cycle. Environmental factors can act singularly or in combination to cause sub-lethal stress that increases sensitivity to events that would normally be tolerated. Significantly elevated bottom temperatures during the summer and fall of 1999 lead us to focus primarily on co-variations in temperature and dissolved oxygen.”

Glenn Lopez and Robert Cerrato, also of MSRC Stony Brook, will find out to what extent high summer temperatures in Long Island Sound’s bottom waters have negative impacts on lobsters and if larger lobsters are more susceptible to temperature stress than smaller ones. The results of their lab studies may be used to predict the effects of long term changes in summer temperatures on the health of the LIS lobster population. The study will shed light on normal patterns of lobster stress and mortality as well as the extraordinary mortality event of fall 1999.

Anne McElroy and Bruce Brownawell, of SBU’s MSRC will address the potential link between pesticide use and lobster mortality. They will measure mortality and immune response in larval and juvenile lobsters exposed to environmentally realistic levels of pesticides (Malathion, Methoprene, and selected pyrethroids such as Anvil and Scourge). The team will also develop ways to measure levels of these pesticides and their breakdown products in

seawater, sediment, and possibly lobster tissues. They are particularly interested in sampling water after storm events when concentrations may be highest. “The results of this study should provide a strong indication whether or not pesticide use is likely to contribute to degraded lobster health in Long Island Sound,” states McElroy. The study will also shed light on the effects of temperature on the immune response of young lobsters.

SUNY Purchase’s **Jan Factor** will look at how lobsters defend themselves against infection and disease. He will develop methods that will allow the assessment of cellular defenses against infection and disease after sub-lethal exposure to environmental stresses and toxic substances. Says Factor, “Our research may lead to an explanation of the recent mortalities by enabling assessment of impacts on the immune system that may lead to lethal infections.”

At the Chesapeake Biological Laboratory, **Robert S. Anderson** of the University of Maryland Center for Environmental Sciences will use cutting-edge biotechnology to measure the blood cell-related defense system of the lobster against disease. “This research will lay the groundwork for discerning changes in immune response due to toxicity or other environmental stressors,” explains Anderson.

By comparing shell disease in lobsters from eastern Long Island Sound with those from Buzzards Bay, Massachusetts, **Andrei Chistoserdov** (MSRC) and **Roxanna Smolowitz** (Marine Biological Laboratory, Woods Hole) will identify the kinds of bacteria that cause lobster shell disease. The team will also design a set of specific probes that will be used to test for such pathogens.

<www.seagrant.sunysb.edu/LILobsters/LILobsters.htm>

Fostering Coastal Businesses Continued from page 11

Currents) and more recently at the Northeast Recreational Research Symposium. In addition to publishing the symposium proceedings, NYSG hosts workshops and assists state agencies and stakeholders who can directly implement the study’s recommendations.

While Todd’s research has been a socio-economic survey, New York Sea Grant has also sponsored numerous research projects on the science of diving. At the State University of New York at Buffalo, investigators **Gerald Logue** and **Claes E. Lundgren** worked to define the role of a diver’s age and the tendency to develop decompression sickness. Their

results showed that the rate of nitrogen elimination does not appear to play a role in the susceptibility of older persons to decompression sickness as had been hypothesized. However, there is a correlation between a diver’s plasma triglycerides and a tendency to form bubbles with decompression. Lundgren’s seminal work on decompression sickness and breath-hold diving is highlighted in CoastWatch on page 8 of this issue.

—Barbara A. Branca, Jay Tanski and Dave White

LastWave

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Explore us online this summer

In March 2001, NYSG online was honored with the "People's Choice Award" at Sea Grant Week, a biennial gathering of some 300 individuals representing the 30 Sea Grant programs nationwide. If you're not one of the 7,300 people who logged on to www.nyseagrant.org in June, dive in and discover:

- **What** New York industries have an \$11.5 billion impact?
- **Why** are a handful of interns combing a 17-mile stretch of Lake Ontario's eastern shore?
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Our web site also features results from a new report on LI Sound's health, insights on personal boating and profiles on saltwater fish such as bluefish and summer flounder. And look for this issue of *Coastlines* as well as other materials under "Publications."

New York Sea Grant Publications

Agritourism in New York: Management & Operations. Diane Kuehn and Duncan Hilchey. 2001. \$1.00

The Economic Contribution of the SPORT FISHING, COMMERCIAL FISHING, and SEAFOOD INDUSTRIES to New York State. Prepared by TechLaw, Inc. for New York Sea Grant. 2001. \$5.00

Stormwater Runoff Best Management Practices for Marinas: A Guide for Operators. Jay Tanski. 1998. \$2.00/\$1.25 for multiple copies.

Journal Reprints

Assessing the relative importance of recall bias and nonresponse bias and adjusting for those biases in statewide angler surveys. Nancy A. Connelly, Tommy L. Brown and Barbara A. Knuth. 2000. *Human Dimensions of Wildlife*. 5:19-29. \$1.00

Effects of organic carbon, organic nitrogen, inorganic nutrients, and iron additions on the growth of phytoplankton and bacteria during a brown tide bloom. Christopher Gobler and Sergio A. Sañudo-Wilhelmy. 2001. *Marine Ecology Progress Series*. 209:19-34. \$1.00

Sedimentary characteristics and acoustic detectability of ship-derived deposits in western Lake Ontario. Vicki Lynn Ferrini and Roger D. Flood. 2001. *Journal of Great Lakes Research*. 27(2):210-219. \$1.00

Cardiovascular changes during deep breath-hold dives in a pressure chamber. M. Ferrigno, G. Ferretti, A. Elliss, D. Warkander, M. Costa, P. Cerretelli and C.E.G. Lundgren. 1997. *Journal of Applied Physiology*. 83(4):1282-1290. \$1.00

Diving decompression fails to activate complement. K.A. Shastri, G.L. Logue, C.E.G. Lundgren, C.J. Logue and D.F. Suggs. 1997. *Underwater & Hyperbaric Medicine*. 24(2):51-57. \$1.00

SCUBA DIVING & UNDERWATER CULTURAL RESOURCES. Reprint Series 2001. Scuba diving & underwater cultural resources: Differences in environmental beliefs, ascriptions of responsibility, and management preferences based on level of development. Sharon L. Todd, Tiffany Cooper, Alan R. Graefe. 2001. Reprinted from *Proceedings of the 2000 Northeastern Recreation Research Symposium*. \$1.00

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Ask Sea Grant!



Lobster — Hot 'n Cold

Lobster harvesting has been a Long Island tradition since colonial times. Lobsters are primarily harvested in Long Island Sound with baited pots that are set at the bottom and marked by buoys. The lobster pots used today are similar to the pots that were used throughout the Northeast for decades. But in recent years the lobster industry has implemented several improvements, one of which is an increase in the size of the opening in the pots, allowing more young and undersized lobster to return to open waters.

Lobsters have a unique lifestyle. Adult lobsters live and feed on the Sound's rocky bottom along Long Island's north shore. They generally spend their lives in or around the same locality and don't tend to migrate far. They are nocturnal animals that generally avoid sunlight, and will seek out crevices in the rocks to spend the daylight hours, especially in shallow waters. Lobsters eat a variety of slow moving bottom-dwelling shellfish like mussels, clams, sea urchins, starfish, worms, crabs—even small fish. With such a delicately flavored diet, it's no wonder that lobster meat has a sweet flavor and firm texture that many consider to be the best food the sea has to offer.

—New York Seafood Council

Lobster can be enjoyed in a variety of ways. According to the New York Seafood Council, lobsters are at their best in simple presentations in which whole lobsters are boiled or steamed and served with drawn butter.

How to boil lobster

1. Fill a large kettle 3/4 full of salted water; allowing 2 1/2 quarts per lobster.
2. Bring the water to a boil and put the live lobsters in one at a time, head first.
3. Once the water returns to a boil, simmer for an additional 10-15 minutes for a 1 to 1 1/4 pound lobster.
4. Add 2 to 3 minutes for each additional pound.

Teacher Heather Lesiewicz made this lobster salad for an end-of-school celebration. Heather is the daughter of 30-year veteran lobsterman Greg Lesiewicz.

Heather's Lobster Salad

Ingredients

- 3 lobsters, live (1 to 1 1/4 lbs each)
- 1/2 cup celery, finely chopped
- 1/4 cup yellow pepper, finely chopped
- 1 large sweet onion, finely chopped
- bunch of parsley, fresh for garnish
- 3/4 cup mayonnaise
- salt and pepper to taste

Method

Boil lobsters using the suggested steps. Remove from pot and allow lobster to cool before handling. Remove lobster meat from the tail, body, and claws. Dice the lobster meat and add the rest of the ingredients, saving the mayonnaise for last. Mix gently to combine. Refrigerate. Serve on greens or your favorite bread or crackers. Serves 8-10 as appetizers.



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