Educating for Success

Start with a cadre of bright, enthusiastic high school students. Add the motivation and coaching expertise from a former Sea Grant scholar. The result? The winning team of New York's Ocean Sciences Bowl 2003. For the second year in a row, Andy Matthews' team from Mt. Sinai High School took the top prize and gained a chance for the national title. This annual February event sponsored by CORE (Consortium for Oceanographic Research and Education) nationally and co-sponsored locally by Stony Brook University's Marine Sciences Research Center, brought together 20 teams statewide to challenge their understanding of marine science. For students and teachers to come from as far away as Churchville-Chili High School near Rochester (placing an admirable third), the draw is the high interest and value placed on the study of coastal sciences.

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From the Director

As Bob Kent so aptly describes on pages 4 and 5, this issue focuses on NYSG education—with an emphasis on formal education. There is much overlap between the varied education and extension activities of New York Sea Grant staff. NYSG staffers work alone and collaboratively to educate individuals and groups of secondary, undergraduate and graduate students, teachers, and stakeholders about important coastal issues.

Some staffers work one-on-one whether mentoring non-traditional students at Empire State College or in Cornell's Native American Program, instructing undergraduate dune stewards for eastern Lake Ontario eco-tourism interpretation, engaging interns to prepare a NYC Habitat Estuary Program Teachers Guide, or using student annotators at the National Aquatic Nuisance Species Clearinghouse. Other NYSG staff educate in small groups. Examples include courses for K-12 teachers on Hudson River stewardship, estuaries (with the American Museum of Natural History), tropical marine biology (with Cornell and the University at Buffalo), and aquatic ecology (with federal agencies and Niagara University), hands-on student involvement in habitat restoration and talks about various specific technical topics, as well as careers in coastal science.

At the undergraduate level, four NYSG staffers are working together to teach a seminar on Great Lakes issues at SUNY Brockport. Others will teach a Great Lakes Ecology course at the University at Buffalo and Aquarium Science at Niagara County Community College.

Government and business also benefit from Sea Grant education. Small municipal groups learn about control of non-point pollution and stormwater management (see picture below). Business managers receive instruction toward certification for pesticide use or seafood pathogen control. NYSGers also teach marina best management practices for control of pollutants and charter-boat management. Finally, interactive Internet courses reach large groups within the seafood industry with information needed to develop processes that ensure meeting new seafood safety regulations.

Across a spectrum of diverse audiences, education is an important part of NYSG's services to stakeholders.

Photo by Paul C. Focazio

At a fall 2002 conference, NYSG's NEMO Educator Eileen Keenan spoke with Nassau and Suffolk County Executives Thomas Suozzi (left) and Robert Gaffney about how stormwater runoff from land, streets, parking lots, and rooftops contain pollutants that can affect the water quality of beaches and shellfish areas. This conference provided municipalities with important practical information and helped facilitate discussion on ways to work together to address this pervasive issue.

Educating for Success

Continued from page 1

Educating the next generation of coastal scientists is a primary goal of New York Sea Grant. In this education issue of *Coastlines,* we'll draw a vignette of a number of students and their mentors whom NYSG has supported in their studies.

A biology teacher at Mount Sinai High School on Long Island, coach **Andy Matthews** currently teaches two sections of marine science. He says that educating young minds is the most important work he's done since graduation from Stony Brook's Marine Sciences Research Center where he was a NYSG Scholar from 1991 to 1996. Working under **Dr. Steven Morgan,** Matthews studied how crabs leave LI's south shore inlets as tiny larvae and return to bays and estuaries as juveniles. During his time as a scholar, Andy learned how to design authentic scientific research, collaborated with many scientists, and presented his original research. Says Matthews, "The financial support I received from Sea Grant was instrumental to my education. It also allowed me to live close to school giving me more time to conduct research and enabled me to travel to conferences and present my research data. The highlight of my fellowship was two summers at sea on a NOAA research vessel." Matthews also received a Thesis Completion Award to complete his masters thesis on the transport of crab larvae in New York Bight.

"With Sea Grant's help, researchers now know more than ever about New York's coastal resources," says Matthews. "They continue to study different aspects of the marine world, collecting valuable data that then can be used by coastal managers to make sound decisions about New York's coastal resources." Matthews' own decision to educate the next generation about marine resources was a sound one with valuable results.

—Barbara A. Branca

In Her Own Words

"I attended the 1995 Great Lakes Student Summit (cosponsored by NYSG) in Buffalo, NY as a high school student. The Student Summit was my introduction to the environmental challenges and concerns in our local area."

— Megan Gollwitzer

Former Great Lakes Student Summit participant

(continued on page 5.)

On the cover

Top left to right: Jack Wittpenn, Rob Letscher and Andrew Matthews, former Sea Grant Scholar and currently Mt. Sinai High School teacher with his winning team at this year's Ocean Sciences Bowl held in Stony Brook. Bottom left to right Lara Herschovitch, Kevin Jwo and Gina Singwith.

This page

Erie County Envirothon Coordinator Megan Gollwitzer (right) presented Orchard Park High School students with a plaque designating them champions of the first locally-held Erie County Envirothon.

Photo courtesy of Ellen Illardo, Water Quality Technician, Erie County Soil and Water Conservation District

Teachers ESCAPE . . .

New York Sea Grant isn't trying to encourage teachers to escape from their classes, but is encouraging them to escape from their classroom routines with exciting, hands-on activities from ***ESCAPE —Exotic Species Compendium of Activities to Protect the Ecosystem.*** The award-winning compendium was produced by teachers involved in a National Sea Grant Program funded project that brought educators from New York, Illinois-Indiana, Michigan, Ohio and Minnesota together to develop and classroom-test activities that focused on aquatic exotics.

The Illinois-Indiana Sea Grant program, led by **Robin Goettel,** compiled the 36 classroom-ready activities into a clever binder that includes a CD, maps, videotape and a container of zebra mussel shells. Each of the activities is clearly explained and offers suggestions and adaptations to fit the materials to various grade levels. The compendium and associated workshops are designed to make educators aware of the environmental impact of exotic aquatics and how they can encourage their students to help stop the spread of these invasive species.

New York Sea Grant educator **Helen Domske** has already coordinated several *ESCAPE* workshops for pre-service teachers and those who have years of experience in the classroom. In a December 2002 workshop that was cosponsored by Erie II BOCES (Board of Cooperative Educational Services) newer teachers were paired with more experienced educators to help them design better ways to effectively utilize the information in their classrooms.

According to the evaluations, each of the 27 educators involved indicated that they gained a great deal of new information from the workshop and that they would utilize the materials and activities from ESCAPE in their classrooms. "I truly enjoyed this workshop and I will be able to adapt many of the activities to my curriculum" said **Misty Kerl** of Lake Shore Middle School. While **Linda Eddy** of Dunkirk Middle School indicated that the workshop was""very interesting and informative both professionally and for personal enrichment and awareness, but I was somewhat alarmed by the devastating impact of exotic species."

Lynn La-Mattina, a fourth grade teacher in Dunkirk, said that the "*ESCAPE* Compendium is a wonderful resource for hands-on activities that are effectively matched to the various grade levels." La-Mattina added that "living and teaching on the shores of Lake Erie is a privilege and we need to educate students about protecting this valuable environment." This is exactly the response that NYSG was hoping for to get teachers interested and excited so they can share that enthusiasm and new-found knowledge with their students.

How We

At home I have a wooden three-legged stool. I'm sure you all know what they look like. I like looking at mine because the three legs gracefully support the seat, giving the seat a firm sense of stability. Sea Grant is something like that three-legged stool, because it, too, has three legs; they are **research, outreach** and **education.** These three legs of our program ground us and make us a complete and balanced program.

The two previous issues of *Coastlines* focused on research and extension. This issue focuses on education, especially in the area of formal education. Our NYSG programs foster education in three broad areas. First, we are training the next generation of coastal scientists and business leaders primarily through our Sea Grant Scholars program that supports graduate students in universities across our state. Secondly, we train educators both in formal K-12 settings as well as those working in informal settings such as nature centers, so that they can bring the latest science-based coastal information to their students.

At the 2002 National Marine Education Association meeting, Sea Grant staff from across the country set eight goals for Sea Grant's Education Program nationally. What we do in New York is reflected in these goals.

- **Develop and implement marine science professional development programs for teachers**
- **Design and facilitate hands-on educational programs for people of all ages to excite them about our watery planet**
- **Provide marine and aquatic-related research and educational opportunities for graduate students**
- **Develop high-quality marine and aquatic curricula based on "sound science" for use in educational settings**

The teachers and others who utilize the *ESCAPE* compendium can have their students listen to rap and folk music, use board games and maps, create wanted posters, work on puzzles, conduct experiments or even create exotic species bracelets to help them learn about exotic aquatics. These innovative teaching tools will provide opportunities for students to learn about the biology, introduction and ecosystem impacts of exotic species.

To view sample activities, go to www.iisgcp.org/edu/escape/index.html. The *ESCAPE* Compendium can be ordered for $63 (includes shipping) through NYSG's Buffalo office (SGBuffal@cornell.edu). A laminated color version of the two game boards costs an additional $10; the complete set can be ordered for $70.

—Helen Domske
NYSG Coastal Educator

Educate

Finally, we reach out to citizens across the state with information about the coast so that they can make informed decisions about the future of their communities. (Read more about NYSG's successful outreach education programs in the Fall '02 issues of *Coastlines*.)

Many individuals foster the three areas of NYSG's educational program across the state from Buffalo to Montauk, whether associated with our efforts in outreach—extension and communications—or in research. All Sea Grant staff has the common goal of engaging students, educators, and the public in the pressing coastal issues of our day, and making our Sea Grant-funded, sound scientific research accessible and understandable to our citizens. This issue of *Coastlines*—starting with the examples on the front cover—gives a sampling of the lives and careers that have been shaped, impacted, and inspired by some of New York Sea Grant's educational programs.

— Robert J. Kent

NYSG Marine District Program Coordinator

- **Foster the inclusion of groups traditionally underrepresented and underserved in marine and aquatic sciences**
- **Encourage education and training in the effective use of new coastal technologies**
- **Serve in a leadership role in fostering collaboration and partnerships with NOAA, as well as other agencies and organizations with an interest in marine education**
- **Develop methods to evaluate the effectiveness of Sea Grant's educational programs**

Learning can be fun. The expressions on the faces of these teachers show that they enjoy cooperative learning. These teachers attended an ESCAPE workshop cosponsored by Erie II BOCES.
Photos pages 4 & 5 courtesy of Helen Domske

In Her Own Words

Continued from page 3

Attending the Great Lakes Student Summit proved to be an experience that significantly impacted my future. I was immediately impressed by the knowledge and commitment of the Summit organizers and workshop presenters, and was encouraged by their challenge to learn more and become an active part of making a difference for our environment. The idea of working to protect the environment no longer seemed like a distant possibility relevant only to the rainforest or ocean environment. I realized that it was a distinct and immediate challenge right in our own Great Lakes region.

After graduating from Amherst HS in 1996, I attended the University at Buffalo and pursued as many opportunities involving the environment as I could. I interned or volunteered for the US Fish and Wildlife Service, New York State Parks, the Buffalo Zoo, the Western New York Earth Day Exhibition, and the Erie County Environmental Management Council. I graduated from UB in 2000 with a B.S. in Environmental Studies and a B.A. in English.

Currently, I work as a Program Assistant for the Erie County Soil and Water Conservation District where a primary responsibility is environmental education. The District's main educational program is the Envirothon, an outdoor, hands-on natural sciences competition for high school students where student teams complete challenges in the areas of forestry, soils, aquatics, wildlife, and current environmental issues. It is also my responsibility to sit on the 2004 Great Lakes Student Steering Committee.
(See photo on page 3)

My own interest in the environment grew because someone else had taken the time and effort to communicate to me the importance of today's environmental concerns. I am grateful for the sense of environmental stewardship that the Student Summit ignited in me. It is an honor to now be working with some of the same people who inspired me in 1995; I hope that I can be as effective as they were in inspiring others to care about our environment.

*(Ed note: NYSG's Coastal Educator **Helen Domske** has been a Great Lakes Student Summit organizer, workshop presenter and mentor since its inception.)*

—Megan Gollwitzer

The World Within the Lake

In this special issue of *Coastlines* we strive to tell our readers a few stories about education. But every good story has a setting and for the next series of stories, the setting is in New York's Great Lakes.

This pen and ink illustration captures some of those stories about the Great Lakes ecosystem. Big fish are eating little fish. Exotic species are insinuating themselves in the food chains of long-time residents. As these stories of change have occurred, New York Sea Grant has been observing, recording, researching. Over the last few decades, NYSG research, outreach, and education in

About the artist

Jan C. Porinchak comes from a family of artists and art educators and is himself an art teacher on Long Island. In this *Coastlines,* his detailed work illustrates the exquisite intricacy of such subjects as the flora and fauna of the Great Lakes and of Long Island bays (see pages 14-15). An avid outdoorsman and naturalist on Long Island, he also enjoys fishing in the Great Lakes. Jan's powers of observation are keen and his wife did not complain at all about the fish head in the refrigerator needed to complete this project!

Lake Ontario and Lake Erie have centered on such topics as lake food webs, population dynamics, and predator-prey interactions, with special emphasis on fish communities, fish ecology and their population dynamics. Groundbreaking work has been done, too, on aquatic invasive, exotic, and non-indigenous species. Some projects have also addressed topics born of human activities and interactions such as water quality, habitat destruction and the economics of sportfishing and agritourism.

Take the Lake Challenge

How many stories do *you* see in the illustration? We challenge you, our valued readers, to take a good look and tell us the names of all of the species you see on these pages. You might get some hints as you read the next few pages. (You'll notice that to show microscopic organisms, the drawings are not to scale.)

Readers that can send us a correctly labeled copy of the artwork by September 15, 2003 will receive a copy of this or a similar illustration suitable for framing. Common names will be accepted and scientific names if you can. Make sure you keep a copy for yourself. And for you educators that would like to have this artwork available in poster size to create activities that teach about Great Lakes aquatic ecosystems, let us know about your interest by the same date. Look for an answer key in the Fall issue of *Coastlines.* Good luck!

—Barbara A. Branca

Invader Watchers: The Next Generation

Since the early 1970s, NYSG has supported over 300 *Sea Grant Scholars*— students pursuing advanced degrees who assist researchers in NYSG-funded projects. What better measure of the long-term impacts of Sea Grant research and education could there be than the lives of such deserving scholars? We've tracked numerous scholars throughout the years. Their stories and accomplishments could easily fill volumes. We had to narrow down to just several vignettes. We start in this article with graduates who are playing instrumental roles in measuring invasive species in the Great Lakes and their impacts on related ecosystems.

Benthos Between Scholars

Being a Sea Grant scholar in the mid to late '90s allowed **Christine Mayer** to finish her graduate studies at Cornell in a relatively short time. "I was able to focus heavily on conducting my research rather than working as a teaching assistant," says Mayer, who received her PhD in three-and-a-half years. In 1994, she began working with **Ed Mills,** Director of Cornell University's biological field station at Shackelton Point along Oneida Lake, and researcher **Lars Rudstam.** The investigators were looking to identify what effects activities of zebra mussels were having on yellow perch and other fish in Oneida Lake. The lake is often the focus of studies addressing such concerns because its ever-changing environment makes it a model for processes in the Great Lakes.

While working on this project, Mayer learned to analyze large ecological data sets and how to approach research questions from an ecosystem-wide perspective. Nearly four decades of historical data suggested that zebra mussels, through filtering activities, were shifting the flow of energy in the aquatic food web from the water column to the bottom or benthic environment. This food web alteration, known as benthification, allows invertebrates - isopods, amphipods, mayflies, and mites - to flourish.

Mayer's efforts culminated in her 1998 thesis on the effects of zebra mussel introduction on the lake's benthic environment and yellow perch. She was a Thesis Completion Award

Photo courtesy of Ed Mills

Jocelyn Ban (left) and Erica Esser (right)— summer undergraduate interns of researchers Randy Jackson (Cornell) and Christine Mayer (Syracuse U)—are all smiles posing with a lake sturgeon aboard a research vessel on Oneida Lake. These protected benthic fish, which feed on the lake's invasive zebra mussels, have been the focus of a restoration program for nearly a decade.

winner that year. "My thesis work on Oneida Lake showed no negative impact on yellow perch associated with zebra mussels," says Mayer. In fact, she adds that young-of-year yellow perch grew significantly faster after mussel introduction than before. Also, zebra mussels eat only very small zooplankton, and at the time of her analysis, zooplankton numbers had not gone down. This is a good sign, because zooplankton are a primary food source for walleye, yellow perch, and other sport fish.

Photo by Ed Mills

Moments like these during *Christine Mayer*'s mid-90s graduate studies were priceless. Along with *Kristen Holleck*, a research technician at the Cornell Biological Field Station, the former Sea Grant scholar (left, head covered in plants) took this brief break from examining the effects zebra mussels were having on native species.

Mayer is currently a faculty member at Syracuse University, where she conducts research in aquatic ecology on NY's inland and Great Lakes. In addition to teaching undergraduate classes in ecology and environmental science, she's now mentoring three students, one of whom, **Bin Zhu,** is a Sea Grant scholar.

Zhu has worked with Mayer, Mills, and others since 2002 on a NYSG project examining the changing importance of benthic processes in lakes. In recent years, water clarity in the Great Lakes and inland lakes has increased thanks to grazing by zebra mussels and reductions in the amount of nutrients that human activity adds to the lakes. Because the water is clearer, light penetrates deeper into the lakes. Therefore, Mayer says, benthic habitats are becoming more productive and will play a greater role in the lakes' energy cycling and food web dynamics.

> *"The financial support I received from Sea Grant helped me focus more time on research."*
>
> *—Bin Zhu Sea Grant Scholar*

Zhu has been assembling and organizing data sets on a wide range of freshwater ecosystems to test hypotheses related to benthification. "One of the primary objectives of this research was to define the scope of benthification," he says. This involved quantifying the extent to which zebra mussel introduction has increased water clarity across a range of systems.

Building on preliminary studies involving plants and hydroacoustics in Oneida Lake, Zhu has assisted in similar analyses in Irondequoit Bay and Lake Ontario. This information will be compared to historical photographs to determine how this habitat suitable for various fish species has changed.

Currently, Zhu is examining the effects of zebra mussels on invasive watermilfoil and purple loosestrife, native cattails, and other plants. He is measuring nutrient levels in a series of experiments with and without the presence of the invaders.

Mills has mentored his share of scholars as well. Since the early 1990s, this internationally renowned invasive species researcher has overseen over a half dozen NY Sea Grant research projects - and as many Sea Grant scholars - addressing these invaders.

In 1992, Mills and a research team, including Sea Grant scholar **Adrian Spidle,** analyzed differences between two similar invaders - zebra and quagga mussels (*Dreissena polymorpha* and *D. bugensis*, respectively). With their impacts on the Great Lakes fishery costing close to a billion dollars by the end of the 20th century, Mills saw importance in making distinctions between them.

"The discovery of quagga mussels in North American waters raised legitimate concerns about their ecological impact, cost, and control," he says. "We found the quagga was more susceptible to death at elevated temperatures than the zebra mussels." Because quagga mussels were responding to thermal control techniques already in use for zebra mussels, Sea Grant-funded findings such as these helped save time and money from developing new control methods.

Continued on page 10

> *"Sea Grant funded research provides critical information to coastal managers so that they can understand the ecological dynamics of the systems they are trying to manage."*
>
> *—Christine Mayer Former Sea Grant Scholar*

Continued from Page 9

Sea Grant scholar and Cornell graduate student **Allison Gamble** took part in a nearly completed Mills study. State-of-the-art spectrometers were used to generate data to assess Oneida Lake's evolving ecosystem patterns and structure. One of the first measures undertaken by the team was to determine the system's quantities of phytoplankton and zooplankton. Gamble's analysis of this data was the basis of her graduate work, for which she won a Thesis Completion Award in Fall 2002.

The data showed more benthic invertebrates and less plankton were present in the lake environment. This led Mills to wonder: Are yellow perch responding to these populations by consuming differing amounts of invertebrate prey? In his mid-1990s study with then Sea Grant scholar Mayer, some of the groundwork was laid.

In that study, the team examined the feeding rate of yellow perch consuming amphipods with and without zebra mussels and under different light conditions. The presence of zebra mussel shells lowered the number of amphipods that yellow perch ate and the exotic's shells provided hiding places for the amphipods. However, the fish ate more benthic amphipods with greater light, suggesting that in a mussel-invaded lake, yellow perch may get more invertebrate food off the bottom, but only in areas where there are not large numbers of mussel shells. Further studies showed that larger perch consumed greater numbers and larger amphipods than smaller fish.

> *"Sea Grant's research and extension efforts generate a better understanding of coastal resources, and their results are well applied where it is needed."*
>
> *—J. Ellen Marsden Former Sea Grant Scholar*

The importance of all this work? Says Mayer, "After zebra mussel introduction, we saw fewer adult yellow perch with empty stomachs and more with zooplankton and benthic prey. However, we did not detect an increase in adult perch growth rate. It is possible that although more fish are consuming invertebrate prey, each fish is not consuming a lot of prey mass. Also, since the young-of-year fish are growing faster, it is possible that they enter the adult phase larger and therefore need more food to sustain the same growth rate."

Overall, findings had an immediate extension value to lake managers, fishermen, utilities, scientists and policy makers. How? "We've provided coastal managers with critical information on how these processes work so that they can make more informed decisions," says Mayer. "Detailing what species are present and what kind of plant productivity is passed through the food web has helped managers understand the ecological dynamics of the systems they are trying to monitor."

Invasive Effects

As a doctoral student and Sea Grant scholar in the late '80s, **J. Ellen Marsden** worked under Cornell researchers Charles C. Krueger and Bernie May on a NYSG-funded study to help further enhance trout fishing.

Lake trout – once a top-level predator and important species for the Great Lakes' sport and commercial fishery – were in severe decline by 1960 because of sea lamprey predation and overfishing. While efforts to restore lake trout populations have been underway since the early '70's, evidence of natural reproduction by stocked trout was not found until the late '80's. But, thanks to this research conducted by Marsden and others, the goal of achieving a self-reproducing population of lake trout is closer at hand.

Throughout her professional career, Marsden has had a number of highly productive collaborations with Sea Grant extension specialists, whom she values for their skill at communicating science to the public. Now at the University of Vermont, she's working with **Mark Malchoff**, a Sea Grant Aquatic Resources Specialist, and Cornell's **Patrick Sullivan** on a three-year sea lamprey tagging project in Lake Champlain funded by the Great Lakes Fisheries Commission through July 2004.

A new wave of invaders

Former Sea Grant scholar Christine Mayer and Cornell collaborator Nancy Tisch are studying how the Eurasian crustacean *Echinogammarus ischnus* is affecting native species of New York's Lake Ontario and the Seneca and Oswego rivers, such as long-time resident *Gammarus fasciatus*. A Great Lakes invader since 1995, this freshwater relative of shrimp lives in between the shells of zebra mussels and in other habitats.

Oneida Lake has served as a control environment for Mayer's studies, a place where she thought the invader did not live. That was, until early November 2002, when she discovered the translucent amphipod in a clump of benthic algae near the lakeshore off Shackelton Point.

Top: NYSG researcher and former Sea Grant scholar Ellen Marsden (center), along with US Fish and Wildlife's Wayne Bouffard (right) and Steve Smith, uses equipment to shock sea lamprey out of their muddy burrows, then scoops them up into nets. Photo courtesy of Mark Malchoff

Bottom: Marsden captures lake trout in traps submerged on spawning reefs at areas along NY's Lake Champlain shoreline. Photo by Brian Ellrott

Estimates on the number of sea lamprey entering the lake will help fisheries managers set realistic targets for an effective control program.

In a separate National Sea Grant-funded project, Marsden, Malchoff and others are identifying and evaluating potential solutions for a fish-repelling barrier at the Lake Champlain Canal. Closing this route to aquatic invaders has been an issue for at least a decade now, as the canal continues to be a major vector for transporting exotics into the lake and, from there, inland waters in the lake's basin.

Along with UVM's Mark Beekey, Marsden is also tracking the spread of zebra mussels in Lake Champlain's soft sediments in a NYSG-funded study. It is here that activities of the filter feeders are most likely having a negative effect on the type and availability of prey for bottom-feeding fish. The flourishing of zebra mussels may benefit fish preying on the aquatic invader. But, their increase could also lead to the decline of the endangered sturgeon and other species relying on the soft sediments as an environment for juvenile foraging. "Lake sturgeon are currently the focus of a developing re-establishment plan in Lake Champlain, so there is a critical need for information relating to the evaluation of their current status and potential restoration," says Marsden.

Photo courtesy of Dave Warner

"We've concluded that *Cercopagis* was a competitor for zooplankton," says Sea Grant scholar Dave Warner on findings that the *Journal of Great Lakes Research* will publish this summer. *Cercopagis* – a native of the Caspian and Aral Seas – is considered a new prey for alewives and rainbow smelt in Lake Ontario.

Seeking out Cercopagis

With help from Sea Grant scholar **David Warner** and undergraduate Tara Bushnoe (pictured) researchers from Cornell are helping define the role of aquatic invader *Cercopagis pengoi* in Lake Ontario's food web in a late '90s study. For their part, Warner and Bushnoe collected samples of the "fishhook water flea" aboard SUNY Brockport's *RV/Madtom*.

"As a Sea Grant scholar, I have been fortunate to work with a group of such accomplished researchers," says Warner, who completes his doctoral studies this December. "I've learned a great deal from interacting with investigators such as Ed Mills and Lars Rudstam and now realize how vital this work is to resource conservation."

—Paul C. Focazio

"Sea Grant is training people like me to look at coastal resources in a diversity of ways that will allow us to provide the knowledge required for conservation of these resources."

—Dave Warner
Sea Grant Scholar

Congratulations are in order to Sea Grant Scholar Walter Mann for his 2003 Thesis Completion Award. Mann, a graduate student at SUNY Cortland has worked under NYSG investigator Sharon Todd to survey preferences of SCUBA divers who seek the depths of Lake Ontario. Here Todd and Mann present their survey results at the dedication of the *David W. Mills,* Lake Ontario's first shipwreck dive site in New York.

Photo by Barbara A. Branca

Cornell graduate Micah Dean holds a trophy-size brown trout during his days as a Sea Grant scholar on a completed Lake Ontario fisheries study. Photo courtesy of Micah Dean

Coast

Taking Stock of Stocking

Brown trout. Chinook salmon. Rainbow trout. Coho salmon. These are just a few of the prized sport fish attracting anglers in large numbers to the shores of Lake Ontario. But, a few years ago, survival of these species in the lake concerned a team of NYSG researchers led by Cornell investigator **Patrick Sullivan**. Also interested in the success of these salmonids were Sea Grant scholars such as **Micah Dean** (above) and **Nathan Smith**.

Signs suggest the lake may not be capable of supporting as many trout and salmon as before. This, of course, has created a challenge in maintaining the delicate predator-prey balance, which is sustained naturally as well as through fisheries management efforts such as trout and salmon stocking.

Dave MacNeill, NYSG's Great Lakes fisheries specialist (and former Sea Grant scholar), believes the amount of available energy needed to support the fish in the lake's open waters may have been declined through the years. "We could have intentional nutrient reductions that began in the late '70s to thank in part for that," he says. These cutbacks were a result of international legislation mandated at the time to improve the lake's water quality. But they seem not to have helped, as now the exotic zebra mussels may be redirecting some of the available food energy to the lake bottom and out of the loop for fish in the open lake waters.

These long-term ecosystem changes in Lake Ontario have presented managers with new challenges, as maintenance of the lake's number of stocked and wild salmonids is directly linked to the production of their forage base. In the past, stocking levels of Chinook salmon and other predators have therefore been adjusted to account for decreases in alewife populations. To better ensure this balance, scholars like Dean and other members of Sullivan's team tracked the survival of the lake's 5.5 million stocked Chinook salmon and trout. They examined growth factors and relative abundance of wild and hatchery salmon juveniles and described the movement of migrating juveniles through the nearshore area.

Watch

In the investigation, which called for study sites at the mouth of the Salmon River and Sandy Creek, Dean assisted with data collection and analysis. Among his preliminary conclusions, juvenile Chinook were present in the nearshore area from April through July, with peak abundance in June. Wild Chinook were more plentiful and appeared to remain longer in the nearshore than hatchery Chinook. And they were also found in significant numbers in the lake's nearshore near the mouth of the Salmon River.

Shortly after becoming a Cornell graduate and Thesis Completion Award winner in May 2002, Dean took a job as a research analyst with the Massachusetts Division of Marine Fisheries. "The stipend I received as a Sea Grant scholar allowed me to focus my attention entirely on my thesis, and not be distracted by trying to work at a job and conduct research at the same time. And now, as my career progresses, I see more and more of a value in the knowledge and experience gained during my fellowship."

Sea Grant scholar **Nathan Smith** helped Sullivan and his team in another investigation. In this study of salmon survival and growth, examining the daily growth rings of species' ear bone, or otolith, was key (see illustration). The otolith provides the fish with its balance, similar to the inner ear in humans.

Preliminary analyses based upon otoliths from juvenile salmon collected in 1999 of known origin suggested that a 'natural tag' in the ear bone's chemistry could be used to identify salmon as being wild or hatchery in origin. This identification of origin is useful in understanding the contribution of the different sources to lake-wide production of salmon. It could also help in the understanding of factors affecting survivorship, growth, and age-at-maturity for these fish.

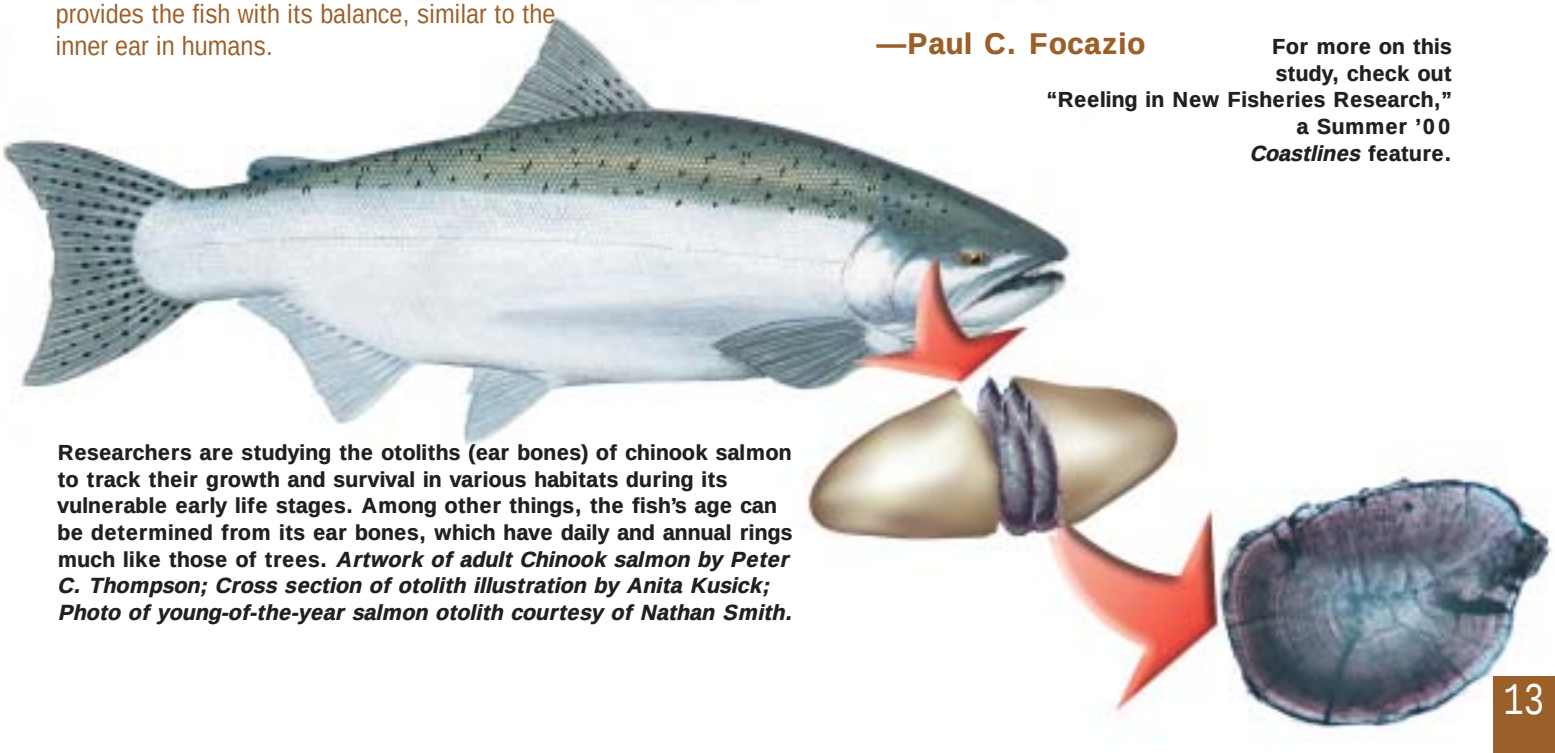
"This research has helped scientists and managers further their understanding of the biology of salmon," says Sullivan. "It has also helped generate substantial data on both stocking rates and angler participation as they relate to fishery productivity for almost a century." Research results and other information on present and future changes in the Lake Ontario ecosystem are available online, at www.dnr.cornell.edu/ext/fish/salmon.htm.

Sullivan says this information helps fisheries managers make informed decisions about the maintenance of a viable fishery. "Predicting the outcome of management decisions on variable ecological systems is difficult, but by using the best available data, scientists can make good approximations."

—Paul C. Focazio

> *"Sea Grant provides a valuable source of funding for research in New York's coastal communities and, in my experiences that research is disseminated and utilized by NYSDEC and other managers in the field."*
>
> *—Nathan Smith*
> *Sea Grant Scholar*

For more on this study, check out "Reeling in New Fisheries Research," a Summer '00 *Coastlines* feature.



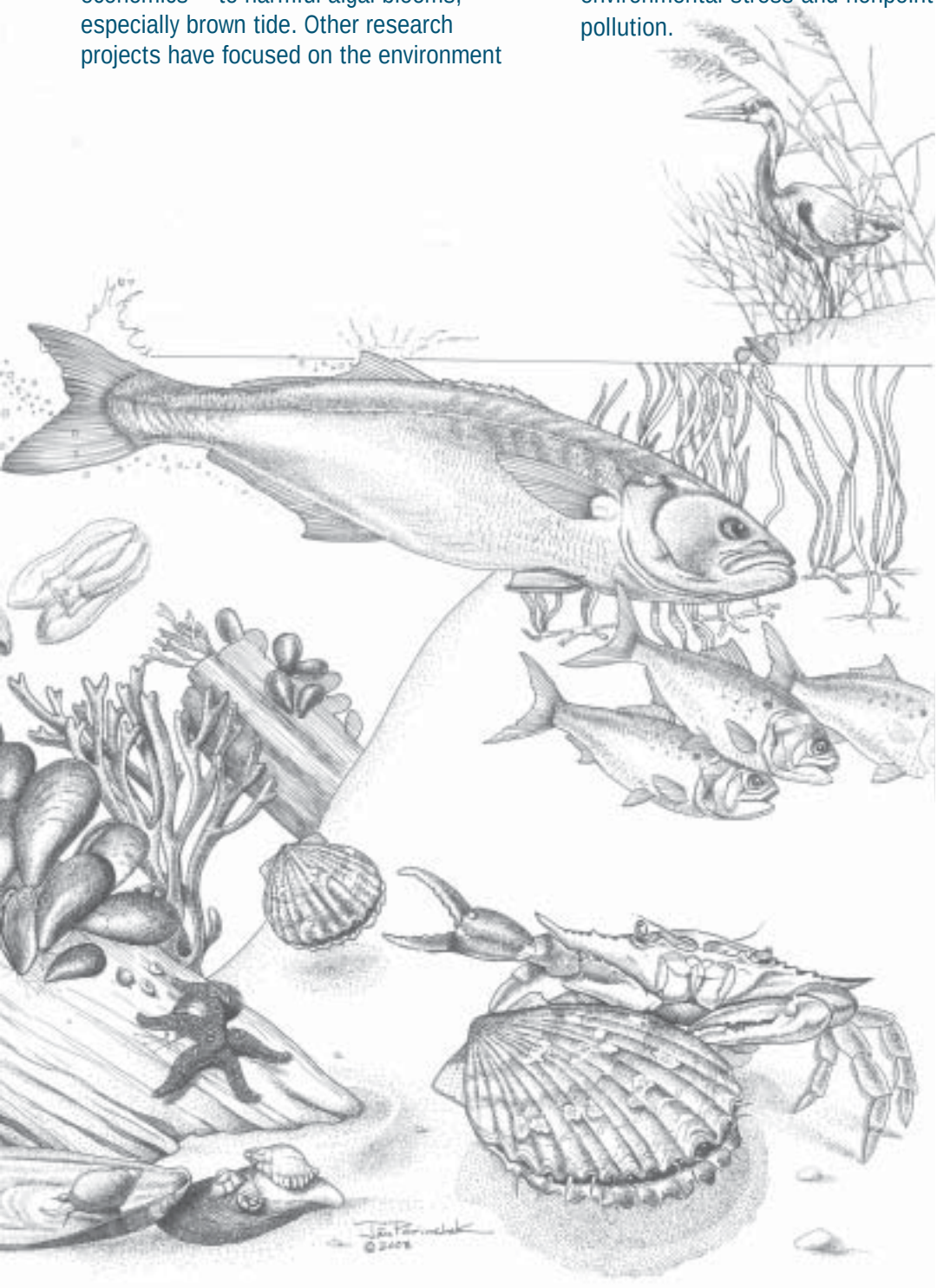
Researchers are studying the otoliths (ear bones) of chinook salmon to track their growth and survival in various habitats during its vulnerable early life stages. Among other things, the fish's age can be determined from its ear bones, which have daily and annual rings much like those of trees. *Artwork of adult Chinook salmon by Peter C. Thompson; Cross section of otolith illustration by Anita Kusick; Photo of young-of-the-year salmon otolith courtesy of Nathan Smith.*

Below the Bay's Surface

In this portion of *Coastlines'* education issue, we change the setting for the next series of stories to the bays and inlets of Long Island.

For this setting, we show a dense profusion of marine flora and fauna that could be found along any number of saltwater inlets. Here microscopic marine plankton form the basis of the food chains that once again lead to big fish eating little fish. But this time many of the shelled invertebrates pictured are not invasive nuisances as pictured in the Great Lakes illustration, but commercially viable species.

The diversity of the biota and habitat illustrated here is reflected in New York Sea Grant's research, outreach and education over the last few decades. Some focus topics are related to the biota large and small: from fisheries and shellfisheries—their health, ecology, management and economics— to harmful algal blooms, especially brown tide. Other research projects have focused on the environment itself. Our bays, inlets, and barrier beaches are shaped by the forces of nature leading to the study of coastal processes, sediment dynamics, erosion, and climate variability. Still other topics stem from the impacts of a large human population along a dynamic marine coast: toxicity, environmental stress and nonpoint source pollution.



Take the Bay Challenge

It is a challenge to show physical environmental factors in an illustration. We are content that these pages are populated with many marine plants and animals—probably in a little closer quarters than you might find if you looked. Again we challenge our valued readers to take a good look and send us a copy of this illustration labeled with the names of all the species. Correct entries will receive a copy of artwork suitable for framing. And for you teachers who would like to have this artwork available in poster size to create activities that teach about Long Island's bays and inlets, let us know about your interest, too. Please have your comments and answers to our Stony Brook office by September 15, 2003. Then look for an answer key in the Fall issue of *Coastlines.*

—Barbara A. Branca

Then and Now on Long Island's Bays and Inlets

This article spotlights many New York Sea Grant scholars from the Marine Sciences Research Center at Stony Brook University who explored Long Island's estuaries, bays, and inlets.

Dr. Monica Bricelj, Senior Research Officer at the National Research Council of Canada's Institute for Marine Biosciences, talks to a local fisher at an aquaculture operation in northern China near Quingdao. Bricelj is one of a handful of foreign consultants working with the governments of Hong Kong and China asked to recommend approaches and research priorities for monitoring and management of HABs and fish and shellfish biotoxins.

A Multifaceted, Multinational Career

When **V. Monica Bricelj** came to the US as a graduate student in 1979, she had already worked as a biologist at the Atomic Energy Commission in her native Buenos Aires, Argentina where she studied the effects of thermal effluents on freshwater fish. Once at Stony Brook's MSRC "I was fortunate to have excellent guidance and strong encouragement from my supervisor, **Dr. Robert Malouf,** who then became director of New York Sea Grant." (Malouf, a noted specialist in bivalves, is currently the director of Oregon Sea Grant.) At MSRC, Bricelj undertook research to determine the effects of suspended sediments on the hard clam, *Mercenaria mercenaria*, a species subject to relatively high turbidities in Long Island's Great South Bay. Being a Sea Grant Scholar helped her obtain a Ph.D.

After graduation in 1984, Bricelj became an Assistant Professor at Southampton College, Long Island University while at the same time participating in a research project on bay scallop population genetics at SBU's Ecology and Evolution Department. Then, as an Associate Professor at MSRC, she sucessfully competed for NYSG funding for projects ranging from PSP toxins in surf clams and mussels, to scallop predators in eelgrass beds and the effects of brown tide on bivalve populations. In 1996 she relocated to Halifax, Canada to become a research scientist at the Institute for Marine Biosciences (IMB) of the National Research Council (NRC) of Canada. Today Dr. Bricelj is a senior researcher at IMB. She is also Adjunct Professor at the Oceanography and Biology Departments, Dalhousie University in Halifax and at the Marine Sciences Research Center (MSRC) at Stony Brook University.

> *"Over the years, student funding by Sea Grant has created a tremendous human resource in the form of a wide-ranging and very effective communication network of professionals, not only nationally, but internationally."*
>
> *—V. Monica Bricelj*
> *Former Sea Grant Scholar*

At IMB/NRC Bricelj leads an interdisciplinary, national and international research program in shellfish biology/ecology and aquaculture. She has been instrumental in the design and renovation of seawater facilities for shellfish research at IMB's Aquaculture Research Station, in Sambro, Nova Scotia. As leader of an international team, she provides advice and research solutions to the shellfish industry both on the Pacific and Atlantic coasts.

"My Sea Grant scholarship gave me an appreciation for the application of fundamental science to resolve problems in fisheries, aquaculture and coastal management. This perspective has remained a *leit-motif* of my research to date. As a scholar, I began interacting with shellfish growers and fishermen in the mid-Atlantic region; now those interactions have extended throughout North America and continue to be an important part of my work."

"Giving Back" to the Bays

While Monica Bricelj has continent-hopped her expertise, **Christopher Gobler** grew up swimming, fishing and boating on Long Island bays. Deep is his life-long commitment to the quality of Long Island's waters and Gobler continues to'"give back" to the bodies of water he knew since childhood.

During the 1990s, Gobler was a Sea Grant Scholar with main areas of research centered on measuring the minute quantities of contaminants and nutrients that affect LI bays and especially the conditions that lead to brown tide. His numerous journal articles written on the subject attest to that. But Gobler also deals in real issues for real people. Pick up a local newspaper today and you might find an article about Great South Bay and the use of coastal resources written by him.

Gobler is also very matter of fact about his Sea Grant support through his graduate years. "If I hadn't received the grant, I would not have been able to attend grad school," says Gobler. His formula is simple: no $ = no grad school.

"Receiving my PhD enabled me to get my position," adds Gobler. As an Assistant Professor and the Marine Science Program Coordinator at Southampton College of Long Island University, he enjoys teaching and utilizing the research skills he acquired during his scholarship tenure.

Although his feet are often wet, Gobler is very grounded. He feels that Sea Grant is helping to prepare coastal managers of the future—quite literally. To start and raise a family has also been an important goal for him. He is married to a biologist, and together the Goblers are raising their own generation of environmentally literate citizens.

Continued on page 18

> *"I believe that Sea Grant's philosophy of focusing fundamental scientific research towards the resolution of coastal management problems and encouraging among scientists the linkages with public education and user groups, has been very successful in preparing individuals for a range of professional careers related to coastal management at the academic, national, and state government levels and in the private sector."*
>
> *—V. Monica Bricelj Former Sea Grant Scholar*

Photo by Barbara Branca

Former scholar Christopher Gobler, now Assistant Professor and the Marine Science Program Coordinator at Southampton College of Long Island University working on brown tide experiments on Shelter Island in 1998.

Then and Now on Long Island's Bay and Inlets

continued from page 17

Photo courtesy of New York Sea Grant

This photograph was snapped in the summer of 1978 when Karen Chytalo and Bill Wise took a number of "benthic grabs" in Long Island Sound.

> *"By funding relevant, problem-driven research on coastal issues and fielding a cadre of trained outreach specialists who are directly engaged on a sustained basis with audiences who are dealing with these issues, Sea Grant is helping to prepare coastal managers of the future."*
>
> *—Bill Wise*
> *Former Sea Grant-supported grad student*

"Grabbing" the Past

When **Karen Chytalo** was a graduate student back in the 1970s, she was studying cores of sediments underlying Long Island Sound. She took many core samples at waste disposal sites along Long Island Sound. Her thesis, "PVCs in Dredged Materials and Benthic Organisms in Long Island Sound," was completed under **Jerry Schubel** who was then Dean and Director of Stony Brook University's Marine Sciences Research Center. (Schubel is currently the director of the Aquarium of the Pacific in Long Beach, California.) And today Karen is the director of the Marine Protection Program in the Marine Resources Division of the NYS Department of Environmental Conservation with statewide responsibilities toward protecting the habitat of our living aquatic resources.

William M. Wise was also a graduate student in the mid-1970s. "I was a student who needed financial support and my advisor, **Dr. J.L. McHugh,** was fortunate enough to get it from the New York Sea Grant Program. This all pre-dates the formal designation by Sea Grant of supported graduate students as 'Scholars,' which came later when I was the Assistant Director of the New York Sea Grant Institute." Of the importance of skills acquired during his graduate student experience, Wise comments, "Communication skills (which McHugh valued highly and are part of the outreach "leg" of Sea Grant's program) are critical to success in life, regardless of one's position and responsibilities." These communications skills have been used to shepherd the next generation of coastal scientists. Wise is currently the Associate Director of the Marine Sciences Research Center at Stony Brook University.

Breaking the Surface

A more recent Sea Grant Scholar, **Nathaniel Buck,** did his graduate work on the levels of metals, organic carbon, and nutrients in Long Island Sound's surface waters. "It's unbelievable that Nate got as much accomplished as he did in a year and a half," says Buck's advisor and project co-investigator Sergio Sañudo-Wilhelmy. The research team (of which Chris Gobler was a part) also evaluated the ability of nutrients and copper to control the intensity of the Sound's phytoplankton blooms.

During 2000 and 2001, the team measured concentrations of metals in water samples from over 40 stations starting at Manhattan's East River and working eastward along the Sound and its tributaries. Nate compiled and analyzed the data, culminating in his thesis in October 2002. Levels of trace metals were generally higher in the East River

A research team took water samples at these stations along Long Island Sound to measure concentrations of metals. Scholar Nate Buck analyzed the data – the first data set of its kind. Map courtesy of Nate Buck.

Congratulations to these 2003 NYSG Thesis Completion Award winners from Marine Sciences Research Center, Stony Brook University: Heather Crowley, Feliza Mirasol, Amy Streck and Matthew Walsh.

and western Sound and inorganic nutrients were two to three times higher further west. Says Sañudo-Wilhelmy of Buck's efforts, "This work has more questions than answers, but it's the first data set of its kind for the Sound." That year Nate was also a Thesis Completion Award winner. Now he's putting his experience to use out in the Atlantic Ocean working as a laboratory technician at the Bermuda Biological Station.

"Current" work in the inlet

Charlene Sullivan, a scholar between June 2000 and June 2002, is just completing her doctorate related to sediment transport in the vicinity of tidal inlets. She looked at the dominant mechanisms of sediment transport at Shinnecock Inlet, NY. "To this aim, we employed and further developed a computer model to simulate sediment transport at Shinnecock Inlet. Computer modeling provided us with the best means with which to carry out this project given the project's complexity and scale."

"Charlie" feels her scholarship has enhanced her understanding of coastal processes and given her the computer skills that are necessary to apply this understanding to present-day coastal issues. One highlight of her scholarship activities was a three-month visit to La Spezia, Italy where she continued this research under **Dr. Daniel C. Conley** currently of the NATO Saclantic Undersea Research Center (and formerly at MSRC).

Being a Sea Grant scholar enabled her to pursue her education full-time without any real financial worries. The financial support provided by Sea Grant is adjusted to the relatively high cost of living on Long Island, whereas other lines of support are not.

Today, she is working in her first real position as a Coastal Erosion Research Assistant at a government agency. She participates in SWASH surveys (Survey Wide-Area Shorelines) to obtain shoreline position data, and then processes and analyzes data. In this job thus far, she has analyzed data to ascertain shoreline change along portions of both North Carolina's Outer Banks and Cape Cod's outer coast. "My SG Scholar experience has provided me with all the necessary knowledge and tools to work in my field with confidence. I would not be where I am today without it. Most importantly, it has taught me what it is to be a professional."

— Barbara A. Branca

"Sea Grant provides future coastal managers with real-world projects that are of interest and importance to a wide range of individuals."

—Charlene Sullivan Former Sea Grant Scholar

Photo courtesy of Josephine Aller

Over the summer of 2002, undergraduates collected data from Jamaica Bay as part of the Research Experience for Undergraduates (REU) program. New York Sea Grant sponsored Michael Pagano (right), a student from SUNY Geneseo. Each summer, qualified students from a variety of universities are chosen for the REU at MSRC, Stony Brook.

Environmental Citizen of the Year

Photo by D. Gervase

Environmental Citizen of the year Helen Domske with NYSG Director Jack Mattice the day of the award presentation.

In fall of 2002, NYSG coastal education specialist **Helen Domske** was presented with the **2002 Paul MacClennan Environmental Citizen of the Year Award** by The Center for Great Lakes Environmental Education, the Erie County Environmental Education Institute, and the Great Lakes Center at Buffalo State College. The honor is named for Paul MacClennan, an award-winning environmental reporter for the *Buffalo News* who was known for his uncompromising efforts to protect the environment and inform citizens.

Helen has more than 20 years experience as an aquatic science educator and has worked with tens of thousands of students, teachers, scout and youth group leaders, and her peers with such agencies as the U.S. Fish and Wildlife Service and New York State Department of Environmental Conservation. Helen is also Associate Director of the Great Lakes Program at the University of Buffalo, editor of the Great Lakes Research Review, and author of numerous teaching materials and a book on Western New York's freshwater ecology.

In recognition of this prestigious award, Domske also received a Citation from the NYS Assembly, which states in part: "Whereas, it is the practice of the Assembled Body to recognize individuals who strive to benefit the communities of the State of NY." In conjuction with her award, Domske was the recipient of an Executive Chamber proclamation from Erie County Executive **Joel Giambra,** and a resolution from the Legislature of Erie County.

Receiving Teachers Award

Photo by Matthew Graff

NYSG's Kimberly Zimmer receives her plaque from NYSMEA Director Bob Abrams.

New York Sea Grant co-sponsored the New York State Marine Education Association (NYSMEA) conference at Southampton College on May 30- June 1, 2003. Over 130 participants viewed the exhibits, attended numerous workshops, visited the local aquarium, and enjoyed boat tours and field trips exploring the habitats of the area. Additional co-sponsors included the American Museum of Natural History, the Wildlife Conservation Society, the New York Aquarium, and Atlantis Marine World. Dr. Melanie L.J. Stiassny, Curator for the Department of Ichthyology at the American Museum of Natural History presented the ideas behind the science of the New Hall of Ocean Life. And the Central Park Zoo/Wildlife Theater Players entertained educators with "The Mystery of the Great Blue Heron Marsh."

At a ceremony during the three-day event, **Kimberly Zimmer,** NYSG Extension Support Specialist received the **Kinghan Service Award** named for NYSMEA's first president, Gene Kinghan, a dedicated east end science teacher. As the retiring NYSMEA Treasurer, Zimmer has developed unique pecuniary procedures that have maintained the financial stability of the Association. This recognition reflects the deep appreciation of the organization's Executive Board and the membership for a job well done.

Photo by Berry Shore

EPA's Christie Whitman with the New York/New Jersey Harbor Estuary director and staff.

Recognizing HEP

Together in front of South Street Seaport Museum's schooner *Lettie G. Howard* for a late-April Earth Day celebration recognizing the NY-NJ Harbor Estuary Program (HEP) were (l-r): EPA's **Robert Nyman,** HEP Director; EPA Administrator **Christie Whitman;** NYSG's HEP Outreach Coordinator **Laura Bartovics;** and NJSG's HEP Technical Specialist **Cathy Yuhas.** The event honored the Seaport Museum and 10 other groups receiving monies through HEP's mini-grants program, which has encouraged citizen participation in the protection and restoration of the estuary since 1991.

"New York Sea Grant has a real understanding of a multi-disciplinary, collaborative approach to issues facing New York's aquatic-based industries."

—Dawn Norton Former graduate student on NYSG research

Launching a "Disease Detective"

"In a nutshell, I'm a 'disease detective,'" says **Dawn Norton** of her position as an Epidemic Intelligence Service Officer, Foodborne and Diarrheal Diseases Branch at the Centers for Disease Control and Prevention in Atlanta. Norton is on 24-hour call for public health emergencies and responds to inquiries from the community, media, government officials and public health professionals. Her job at the CDC is to identify and investigate foodborne disease outbreaks and assist with control measures to help prevent future outbreaks.

Norton's success at her present job stems from her productivity as a graduate student. While pursuing her doctorate, Norton worked on a NYSG-funded project in the area of food safety with Cornell Food Laboratory's Drs. Martin Wiedmann and Kathryn Boor and NYSG seafood specialist, Ken Gall. (See the Fall 1998 issue of *Coastlines* available online for a synopsis of the project and its collaborators in the smoked fish industry.)

"That project really modeled the power of applied science and collaboration! We applied cutting-edge scientific technology to investigate an important food safety issue. Our research with NYSG and the smoked fish industry contributed to a better understanding of an important foodborne pathogen, *Listeria monocytogenes*, and the continued development of science-based policy while providing a basis for future studies." Norton completed her doctorate and has co-authored four publications on the pathogen.

Says Norton, "The project helped to move forward the overall goal of reducing foodborne illness in the U.S. We worked with our industry collaborators to develop targeted strategies for control of this important pathogen in the food-processing environment, which will reduce the risk of finished product contamination. These strategies will facilitate continued compliance with FDA's zero tolerance policy for *Listeria monocytogenes*. It's great that I was able to support NY's seafood industry."

In Norton's experience, each of Sea Grant's components—research, outreach and education—was critical to a project that contributed much to science-based policies and a better understanding of an important foodborne pathogen. She brings this Sea Grant perspective to her job of designing and conducting epidemiologic studies that will lead to practical strategies for control and prevention of foodborne and diarrheal diseases in the US—and the world.

—Barbara A. Branca

Biennial Report

New York Sea Grant

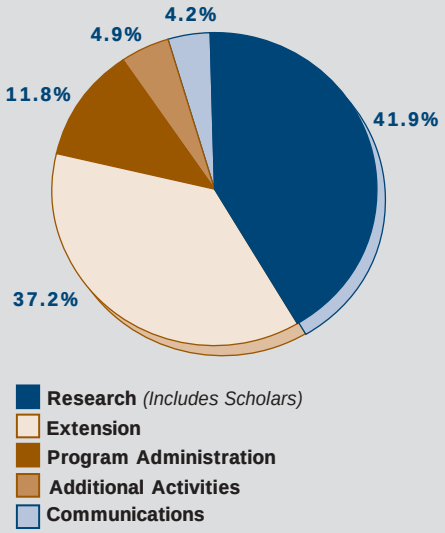
Federal, State, and Other[1] Funds Allocated in Calendar Years 2001 and 2002 for use in 2001-2002 and beyond

	2001 Funds	2002 Funds
Program Administration	$574,393	$851,013
Communications	$294,263	$215,619
Extension	$1,961,765	$2,511,191
Research and Scholars		
Economic Leadership	$757,370	$317,595
Coastal Ecosystem Health and Public Safety	$542,567	$891,719
Initiatives and National Investments		
Aquatic Nuisance Species/Ballast Water Investment	$15,000	$247,030
Hard Clam Research Initiative	$263,487	$3,851
LIS Lobster Research Initiative	$585,338	$563,341
Sea Grant Technology Investment	$88,765	$49,903
Brown Tide Research Initiative (BTRI)	$406,708	
Lake Champlain Research Initiative	$304,026	
Percent of Above Research Funds Allocated to Scholars	13.9%	19.8%
Total Research and Scholars	$2,963,261	$2,073,439
Additional Activities		
Fellowships	$63,600	$67,951
Regional Activities	$3,984	$18,307
LIS Lobster Research Initiative Administration and Outreach	$97,691	$71,305
Hard Clam Research Initiative Administration	$11,946	$12,671
[2]BTRI Administration and Outreach	$104,031	
South Shore Estuary Reserve Technical Advisory Committee	$30,655	
Long Island Sound Technical Advisory Committee Fellow		$25,000
Other Conferences/Workshops/Special Projects	$57,752	$20,991
Total Additional Activities	$369,659	$216,225
Total Funds Allocated	**$6,163,341**	**$5,867,487**
Additional Non-Federal Cost-Sharing or In-Kind Support (not already included as direct support in table above)	$1,650,981	$1,228,942
Unallocated and Pending Committed[3] Funds Carried into 2002	$1,756,769	
Unallocated and Pending Committed[4] Funds Carried into 2003		$1,102,344

Notes: *(1): "Other" includes funds provided by Cornell, SUNY, local and private sources*
(2): Includes funds for BTRI Synthesis project, not yet selected
(3): Includes funds committed to continuation of specific projects/activities, and projects slated to begin in 2002
(4): Includes funds committed to continuation of specific projects/activities, and projects slated to begin in 2003

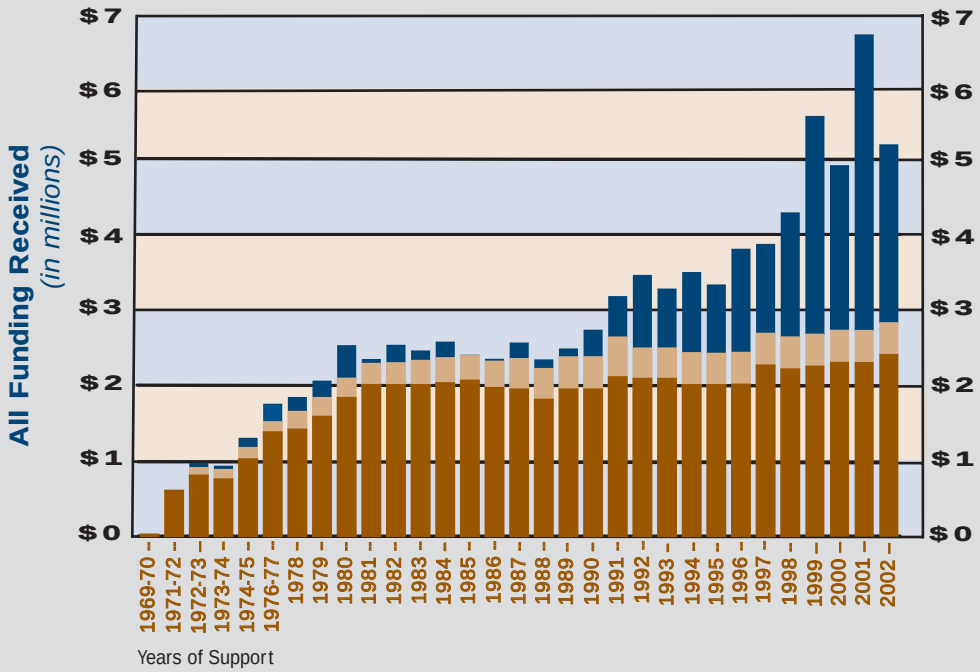
Distribution of Funding Among Program Elements

2001 and 2002 Combined



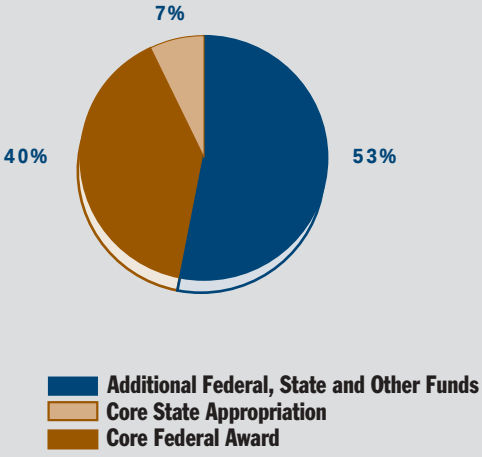
New York Sea Grant Funding

(Since Inception)



Funding Sources

(2001 and 2002 Combined)



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

Submerge this summer with nyseagrant.org to learn:

- Who's educating visitors along Lake Ontario's shores this summer?
- What resulted from this past spring's LI Sound Lobster and Great Lakes botulism symposia?
- How is heightened security of our shores affecting boaters?
- What's the forecast for Great Lakes water levels?
- How is $115K in grant monies being used to increase public awareness and improve the health of the NY-NJ Harbor Estuary & LI Sound?
- What will teachers be learning on Lake Ontario in late July?
- What's cooking in our Seafood Corner archives and newly redesigned water quality and marine fisheries sites?

Special to educators...

Online educational resources abound in our "Related Sites" section. *Ask Sea Grant* a question, link up with *The BRIDGE*, Surf *Sea Grant Marine Careers*, and access NOAA's web-based activities.

LastWave

Ordering Publications

Please send requests for the following publications along with a self-addressed label and check payable to:

New York Sea Grant Institute Communications
121 Discovery Hall/Stony Brook University/
Stony Brook, NY 11794-5001/631.632.9124

Sea Grant Publications

A Teachers Guide to Water Education Resources in the NY-NJ Harbor Estuary Region. NY-NJ Harbor Estuary Program. 2002. *Free*

The Tidal Exchange. NY-NJ Harbor Estuary Program. L. Bartovics, Editor/Designer. Periodical Newsletter. *Free*

Great Lakes Fishes. Great Lakes Network, Wisconsin Sea Grant. 2000. This heavyweight 26.5" x 38.5" color poster features 35 illustrations of fish of the Great Lakes that are anatomically realistic and accurate. Their common and scientific names appear below each illustration. *$5.00*

Fact Sheets

The Nissequogue River: *A River of Special Significance*. E. Keenan. 2003. *Free*

Wild Rice. H. D. Greene. 2003. *$2.50 ($2.00 each multiple copies)*

Journal Reprints

Population genetics of shortnose sturgeon *Acipenser brevirostrum* **based on mitochondrial DNA control region sequences**. C. Grunwald, J. Stabile, R. Waldman, R. Gross and I. Wirgin. 2002. *Molecular Ecology* 11:1885-1898. *Free*

Public support for ecosystem restoration in the Hudson River Valley, USA. N.A. Connelly, B.A. Knuth, D.L. Kay. 2002. *Environmental Management* 29(4):467-476. *Free*

Temporal variability of groundwater seepage and brown tide blooms in a Long Island embayment. C.J. Gobler, S.A. Sañudo-Wilhelmy. 2001. *Marine Ecology Progress Series* 217:299-309. *Free*

Trace metal levels in uncontaminated groundwater of a coastal watershed: Importance of colloidal forms. S.A. Sañudo-Wilhelmy, F.K. Rossi, H. Bokuniewicz and R.J. Paulsen. 2002. *Environ. Sci. Technol.* 36:1435-1441. *Free*

Using the coorientation model to compare community leaders' and local residents' views about Hudson River ecosystem restoration. N.A. Connelly, B.A. Knuth. 2002. *Society and Natural Resources* 15:933-948. *Free*

Seafood Corner

Weakfish

Although the local weakfish catch in New York varies from year to year, weakfish are likely to be most abundant in the marketplace in the fall and, to a lesser extent, in late spring.

The flesh of weakfish is white, sweet, lean and finely textured. It makes a delicious meal when fried or broiled. Because of the texture it's also fragile and must be iced immediately after capture to retain its natural elasticity and flavor. One of the finest methods for cooking weakfish is to cook the fish whole with seafood or other stuffing in the oven or over hot coals on the grill. Weakfish fillets can also be broiled or baked with a variety of sauces or vegetable accompaniments.

Food and nutrition professionals and consumers have known for years that seafood is a high protein food that is low in calories, total fat, and saturated fat when compared to other protein-rich animal foods. In addition, a large proportion of the fat in seafood is polyunsaturated. There is an increasing amount of scientific evidence that the unique kind of polyunsaturated fat found in seafood, called omega-3 fatty acids, can provide additional health benefits.

Excerpted from Seafood Savvy
by Ken Gall
New York Sea Grant
Seafood Specialist

Weakfish on the Grill

Ingredients

4 weakfish fillets (leave skin on)
Old Bay seasoning
juice of half lemon
1 small onion
2 cloves garlic
salt and pepper to taste
1/2 tsp thyme
4 tsp butter
2 cups white wine

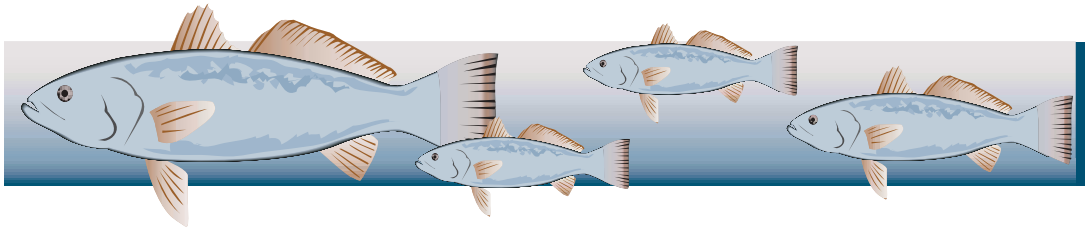
Recipe courtesy of Frank Carnese, grand prize winner of the 2002 Annual Great South Bay Weakfish Tournament, who landed a 10.12 pounder.

Method

Wash fish fillets. Place on heavy duty foil and bring edges of foil up 2 inches to create a sealed unit for each fillet. Sprinkle with 1/2 cup of white wine, lemon juice, salt, pepper and Old Bay seasoning. Mince the onion and garlic and place over each fillet. Top each fillet with a teaspoon butter. Place on the grill for approximately 10-15 minutes. You should be able to use a fork to flake the fish when it is done. *Do not overcook.* Serve with grilled vegetables.
Serving size: 4

Weakfish Nutritional Composition (from the New York Seafood Council) per 3 oz. cooked, skinless portion size

Total Calories	Protein	Carbohydrates	Total Fat	Calories from fat	Saturated Fat	Omega-3 Fatty Acids	Cholesterol	Sodium
110	18g	0g	4g	33 %	1g	0.4g	90mg	65mg



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