A gull at sunset, Lakeview Wildlife Management Area, eastern Lake Ontario
Photo by Katie Maitland

Coastlines

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SETTING THE RESEARCH AGENDA

The eastern shore of Lake Ontario is dotted with dunes, wetlands, forests, grasslands and tributaries that enter the Lake. But this beautiful and unique spot is also part of a larger ecosystem collectively referred to as the Sandy Creeks watershed. The Sandy Creeks watershed comprises four stream corridors, the escarpment of the Tug Hill Plateau, the nearshore areas of the lake and the Lake Ontario dune and bays complex. As well as being home to a variety of flora and fauna, this area is also home to numerous human residents who live in rural residential developments and small villages where agriculture, forestry, tourism and recreation make substantial contributions to the local economy.

Ecosystems like this one are so interconnected that effects on one species—including humans—are likely to cause effects on others. Says New York Sea Grant Director **Jack Mattice**, "When the New York Ocean and Great Lakes Ecosystem Conservation Act was signed into law in 2006, the intention was to shift the paradigm of coastal resource management from single species to ecosystems, using approaches known as ecosystem-based management (EBM). In so doing, EBM is a tool that helps us make decisions that ensure healthy, productive, and resilient coastal environments."

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FROM THE DIRECTOR

Because I will be retiring from New York Sea Grant at the end of December, my first thought was to use this, my 21st and last "From the Director" epistle, to highlight some of the accomplishments that NYSG has made during the last 11 years. I intended to elaborate on NYSG's rating as one of the top seven programs in the national Sea Grant network, the increased visibility of NYSG in the state and nation and the success of NYSG staff in gaining support for specific activities from federal and state agencies. I wanted to detail how we obtained funds to manage research on major national issues (brown tide, lobster and hard clam) and raised the annual state budget by an average of 50 percent per year. Finally, I wanted to discuss the myriad of socio-economic and environmental impacts of NYSG's research, extension and education efforts that have changed the lives of New Yorkers.

Jack Mattice (second from left) with Michael White, left, (director of LI Regional Planning Board, Brian Culhane (aide to NYS Senator Owen Johnson) and David Conover, Dean of Stony Brook University's School of Marine and Atmospheric Sciences (SoMAS).
Photo by Barbara A. Branca

The more that I thought about these accomplishments, however, the more I was reminded that they were the result of collaborations of NYSG's staff and managers, Board of Governors, Program Advisory Council and Program Advisory Networks with national, state and local government agency and NGO representatives; academic faculty and graduate student researchers; national and state legislators and their staffs; the National Sea Grant Office and state Sea Grant programs; and fishing, boating, tourism, and other public stakeholders, i.e., YOU. None of these accomplishments would have been possible without your active support and interaction. I hope that you will rejoice with me in the successes that we have accomplished together.

I was also reminded of the pleasure that accompanied these collaborations. We didn't always agree, but each of us brought unique perspectives to deliberations, and the interplay of ideas helped identify appropriate decisions or directions. The key to the interactions always seemed to be "What's best for NYSG?" or "What can NYSG do to maximize its contributions to sustainable use of coastal resources?" Having you all focus on my most favorite topic—NYSG and how we "bring science to the shore"—was exciting, productive and rewarding. How could I not be pleased with and appreciative of your efforts? In fact, I was and I am.

It is the thought of not interacting with all of you that causes much of my ambivalence about leaving. I can only hope that you and I will still find ways to continue to work together in the future. But, in any case, you have my utmost thanks for your contributions during the last 11 years and my wishes for health, happiness and success in your future.

SETTING THE RESEARCH AGENDA

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Ecosystem-Based Management

With the signing of the Act, NYSG was asked by the NYS Department of State (DOS) to develop a list of prioritized short-term research needs for two diverse sites within the state: the Great South Bay on Long Island (LI) and the Sandy Creeks watershed, which includes the dunes and wetland complex area on the eastern end of Lake Ontario.

With funding from DOS, NYSG convened two workshops—one focusing on Sandy Creeks that took place in Syracuse and another on Great South Bay in Stony Brook—where a broad diversity of researchers used lists of information needs identified by resource managers to develop research priorities for each site. Both groups identified top priority projects aimed at describing both the current conditions and predictions of future changes.

The results identified as the three top priority research needs in Sandy Creeks watershed were: monitoring water quality, using a conceptual ecosystem model to describe how the watershed may respond to future human activities, and assessing public perception with respect to development and ecosystem impacts.

At the Great South Bay workshop, monitoring, modeling and mapping the Bay came out on top. The second priority included determining the scale necessary to do effective restoration, then implementing restoration to reclaim wetlands and/or to reduce runoff and sedimentation. Examining present and future human impacts on the Bay rounded out the top three priorities for this area.

Using the similarities in priorities for the two sites, NYSG outlined a protocol for a statewide EBM research agenda. Used in conjunction with studies from other sites in the state, these priorities can contribute to the state's overall EBM plan.

Seagrass

Great South Bay on Long Island, with its centuries of maritime heritage is perhaps best known for its productive shellfish habitat. It is also home to a large resident human population with millions more tourists enjoying swimming, boating and fishing.

Seagrasses, particularly *Zostera marina* or eelgrass, play an important role in Great South Bay as they do in many shallow underwater areas around Long Island. An eelgrass meadow can provide food and shelter for a diversity of plants and animals, stabilize sediments, and reduce the effects of currents and wave action. Eelgrass grows from the bay bottom, limiting the plant to depths where its leaves have enough light for photosynthesis. As a perennial, its older leaves die off naturally, then wash up on the beach, looking like tangled tape from an audio cassette.

Historically, there have been great fluctuations in the extent of LI's eelgrass beds. There is concern at this time that eelgrass has disappeared from some areas and restoration efforts have been limited in their success. Perhaps there are factors influencing growth and reestablishment that are not being considered.

"New York Sea Grant and a number of other groups (NYSDEC, EPA's Long Island Sound Study and Peconic Estuary Programs, the Suffolk County Marine Extension Program, and The Nature Conservancy) joined forces and developed a workshop to help improve our approach," says NYSG Assistant Director **Cornelia Schlenk**.

"We brought local experts together with seagrass scientists from other parts of the country to consider the situation and look for solutions. Can we take steps to help us most efficiently and effectively work to preserve and restore seagrass habitat? The answer is yes," continues Schlenk.

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ATTENTION GREAT LAKES RESEARCHERS:

Interested in partnering with others with a similar research focus?

Become a part of the Great Lakes Regional Research Information Network. Sign up today at: www.glrrin.info

nyseagrant.org

...for NYSG's full report, *Ecosystem-Based Management in New York State: Taking the Next Steps*, and to view photos of the EBM workshops

Eelgrass (*Zostera marina*) is a seed-bearing plant, not an algae, with roots and runners that anchor it to the bottom.

Photos by Chris Pickerell/Cornell Cooperative Extension Marine Program

The tropical lionfish, a favorite at the Atlantis Marine World, has also been sighted in Long Island Sound!
Photo by Chris Paparo
Atlantis Marine World
www.fishguyphotos.com

COMING TO MARINE WATERS NEAR YOU

The introduction of new species into the Great Lakes and other freshwater bodies, and resultant economic and ecological impacts on freshwater ecosystems has been well documented by years of research. More recently, there has been increased media coverage about similar impacts in marine ecosystems.

Take the case of the lionfish. Reports of this colorful tropical fish (*Pterosis volitans*) in eastern Long Island Sound are quite surprising because this popular aquarium species usually lives in the tropical waters of the Pacific and Indian Oceans. Conditions on the northeastern seaboard are not ideal to support lionfish survival, and, seasonal presence of this exotic would not be cause for alarm if these fish died with the onset of winter. However, increased lionfish sightings could suggest a year-round presence in eastern Long Island Sound.

Invasives Making Waves

How do such species get here? Non-native species may be transported by many vectors including natural means such as ocean currents and hurricanes, by accidental means, and, intentional release by humans. Anglers that fish in Shinnecock Canal on eastern Long Island observe the seasonal arrival of tropical exotic fish such as triggerfish, porcupine fish, and angelfish—a delightful treat! These exotics are transported up the East Coast by seasonal ocean currents and they rarely (if ever) live much beyond the time when water temperatures drop in winter. The earliest sailing ships carried pioneer explorers across the globe and unwittingly transported marine invertebrates in the wooden hulls. Shipworms and sea lice were transported to the United States from Europe in this way more than 500 years ago. Hulls and keels provide a surface for fouling flora and fauna macrocosms to thrive, and, a number of non-native algae and bivalves were transported to Long Island Sound by this method.

Ballast tanks on commercial vessels are filled with water to maintain stability when the vessel is not loaded. Ballast water must be off-loaded (or discharged) when a vessel takes on additional cargo. Oftentimes, non-native species are taken up in ballast materials when the ballast tanks are being filled, and they are transported and released in new areas when the ballast water is discharged. The Chinese mitten crab (*Eriocheir sinensis*) was introduced into waters off the west coast of the U.S. in ballast discharge released by ships that moved cargo from the Pacific coast of Korea and China. This crab was first

The Chinese mitten crab (*Eriocheir sinensis*), introduced into the western U.S. through ship ballast water, appears to be heading east.
Photo courtesy of Paul Heinwitz, Oregon Sea Grant

reported in the mouth of a tributary in the Chesapeake Bay, Maryland, in 2005; more recent reports place it in the lower St. Lawrence River and the lower Hudson River.

Two other non-native crabs have been introduced to the Atlantic coast of the U.S. in ballast discharge. The European green crab (*Carcinus maenas*) is native in waters from Northern Africa to the Baltic Sea. This crab was first recorded in the Mid-Atlantic in 1817, and established communities exist on rocky shores from New Jersey to Prince Edward Island, Canada. The Japanese (or Asian) shore crab (*Hemigrapsus sanguineus*) was first reported in the U.S. in 1988 in New Jersey and has since spread northwards to Maine and southwards to North Carolina. This crab is a permanent resident in LI Sound with large crab communities established on the shores around Westchester County. Populations of native crabs and, ironically, the non-native European green crab declined significantly in LI Sound since the emergence of Japanese shore crabs.

Other industries also create pathways for transporting non-native species. Problems can develop when non-native species are transported and inadvertently introduced in areas where they were not intended to be released. For example, brood stock oysters are shipped in mud and seaweed that provide a refuge for other hitchhiking organisms. In the tristate area, anglers fish in the ocean with bait worms that were imported from Maine while packed in seaweed. Dr. **George Kraemer** (Purchase College, SUNY) is working with a team of researchers at the University of Connecticut to determine if the packaging material shipped with this popular bait is putting recreational and commercial fisheries in Long Island Sound at risk from harmful non-native species that may include animals and toxin-producing microalgae.

Non-native species are usually introduced unintentionally, but, there are exceptions. For example, intentional introductions occur when aquaria pets are set free by their owners; this vector may have facilitated the lionfish introduction in Long Island Sound. Anglers can introduce non-native species when they fish with bait imported from distant regions that was purchased over the Internet. Individuals have been caught trying to smuggle non-native species for the purpose of release in the wild in the hopes of establishing a new fishery, especially when the organism is considered a delicacy.

New Species Impact Marine Ecology

Significant ecological impacts can occur when a non-native species depends on native species as a major food source and later threatens the native species' long term survival. Asian shore crabs eat juvenile lobsters and dense communities of this invasive crab could be disastrous for the lobster fishery that continues to suffer from a major population decline. The European green crab has a voracious appetite for soft shell clams; its introduction was blamed for the collapse of Maine's soft shell clam fishery in the 1950s.

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Japanese (or Asian) shore crab (*Hemigrapsus sanguineus*) among algae, Montauk.
Photo by Alberto Knie

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... to read about exotic aquatic species on the move

THE LEXICON OF INVASION

Non-native species are plants and animals that have been transported, intentionally or unintentionally, into a geographic region outside their native ecosystem. Other terms for non-native species include: introduced, exotic, alien, foreign and transplant. These terms imply that an organism has been transported into a new ecosystem. Examples of non-natives include certain agricultural crops, ornamental plants, aquaculture and fishery stocks, livestock and pets. Such species may have significant benefits when kept under appropriate management.

Invasive species describes organisms that are non-native to the ecosystem where they were introduced and whose presence cause or are likely to cause economic or environmental harm, or create risks to human health.

Cryptogenic describes an organism that cannot be categorized as native or non-native. In the Mid-Atlantic region there are several cryptogenic sponges, jellyfish, and marine worms.

Naturalization occurs when a non-native species reproduces consistently to sustain populations over more than one generation without assistance from external sources, including humans. Although unfavorable conditions in a new ecosystem could kill non-native species, if the organism is resilient, it may adapt and thrive.

PLANTS ARE INVADERS, TOO!

When it comes to exotic invasive species, plants are no slouches. In coastal wetlands, exotic invasive plants such as common reed and purple loosestrife have been tenacious invaders displacing native species over large areas of habitat. Now another species can be added to the ranks of plant invaders on Long Island: Japanese knotweed. Already invasive worldwide, this species is spreading throughout Long Island.

Little is known about Japanese knotweed populations in North America, but thanks to NYSG- funded research, this gap is being addressed. Drs. Massimo Pigliucci and Christina Richards of Stony Brook University conducted a study of the genetics of LI knotweed populations. They found that the dominant way that knotweed spreads is through vegetative reproduction after initial introduction by seed. Their results offer evidence of limited clonal genetic diversity as well as the establishment of both non-hybrid and hybrid knotweed in the US. They also found substantial variation in traits and salt tolerance among plants. The ability to establish new populations by seed, and then spread over a site vegetatively, combined with adaptability to new conditions, contribute to the invasiveness of Japanese knotweed.

– Lane Smith

Invasive species have been linked to several disease outbreaks in New York's marine fisheries. Quahog Parasite Unknown (QPX), a prolific invasive pathogen that affects hard clams, was first recorded in New Brunswick, Canada, in 1959 and an epidemic occurred in New York waters in 2002. Recently, Viral Hemorrhagic Septicemia virus (VHSV) appeared in the Great Lakes, and is responsible for the deaths of several hundred thousand round gobies in the St. Lawrence River and a die-off of gizzard shad in Lakes Ontario and Erie in the spring of 2007.

Such disease outbreaks that occur in major fisheries call for immediate management response. For example, in response to the VHSV threat of 2007, regulations were passed to prohibit the transport of fish and bait between different freshwater bodies in the Great Lakes and the marine district. Actions taken by the State that necessitate closure of major fisheries or considerably limit fishing operations create financial hardship and income loss in coastal communities that depend on the affected fisheries.

Economic burdens may be created if fishermen are forced to spend more money to offset the impacts of invasive species. Baymen used to fish with traps constructed from wooden lathes, but these traps couldn't stand up to attacks from shipworms. Consequently, these fishermen use traps built from durable plastic-coated wire; plastic-coated gear is more expensive, but, doesn't act as a magnet for shipworms. Invasive species can also damage physical structures. Scientists are monitoring reports of Chinese mitten crabs in the Hudson River because these crabs can burrow into the embankment and increase erosion, which can cause blockages on screens that protect intake pipes at power plants, drinking water treatment facilities, and other industries.

A major problem in dealing with invasive species is that our ability to take action is very limited once these species are established. Marine habitats are very difficult ones in which to develop suitable treatment programs, and chemical treatment is usually not a viable option. Options for eradication are usually labor intensive and offer limited success. Given the suite of vectors that contribute to the spread of non-native species, it makes sense to adopt practices that do not exacerbate this problem, especially when non-native species have the potential to invade and control their new ecosystems. It is not easy to anticipate these ill-effects until after invasion is well underway, by which time options for control are limited.

— Antoinette Clemetson with contributions from Chuck O'Neill, Lane Smith and George Kraemer

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...for more information on invasive plants

Anglers that use marine sandworms release other organisms such as amphipods (inset) when they discard the seaweed packaging material into the water.

Photos by Barbara A. Branca

TAKING THE "X" OUT OF QPX DISEASE

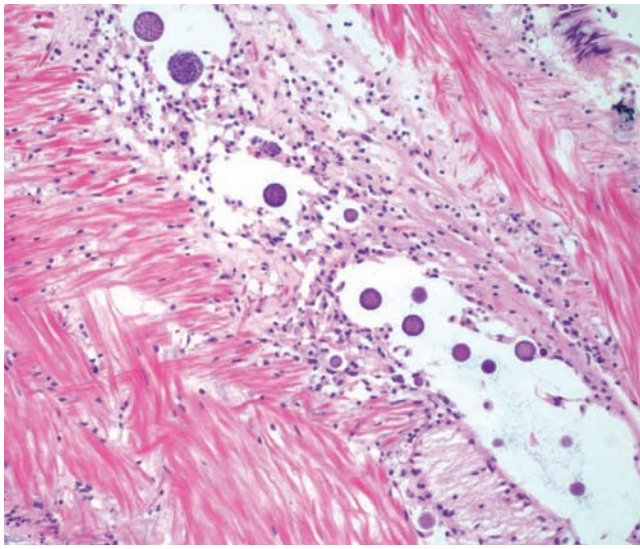
New York Sea Grant's mission is to provide scientific information that helps our coastal economies and environment. "When New York's shellfish industry started seeing large numbers of dead clams in Raritan Bay in 2002, we saw this an an important problem," says NYSG Assistant Director **Cornelia Schlenk**. "Timely research could play a critical role for managers making decisions about this valuable marine resource." That research recently bore fruit, shedding light on the puzzling disease affecting hard clams.

The story begins in 1987. The NYSDEC had introduced a shellfish transplant program, harvesting hard clams from uncertified waters of Raritan Bay off the coast of Staten Island and transporting them to certified Long Island waters. Once purged of bacterial contaminants through a natural cleansing process in designated areas in Peconic Bay, these sturdy bivalves could be re-harvested and eventually marketed as a safe food product.

The Raritan Bay Shellfish Transplant Program not only provided an opportunity for baymen to harvest shellfish from designated areas that were normally closed, but also protected public health by reducing shellfish populations in uncertified waters, making them less attractive to illegal harvest.

According to the NYSDEC's **Debra Barnes**, a marine biologist and Shellfish Management Unit leader in the Bureau of Marine Resources, it was one of the most successful shellfish management programs in the state. "The estimated wholesale value of the shellfish harvested in this program was more than $5 million annually. The program accounted for almost 45 percent of New York State's annual hard clam production and involved the participation of more than 160 shellfish harvesters and up to five shellfish cleansing operations located in Long Island Sound and Peconic Bay."

That transplant program proved effective until 2002, when a severe threat to the New York hard clam industry surfaced. Shellfish transplant harvesters began reporting large numbers of dead and dying clams in the waters off the coast of Staten Island. The diagnosis? A single-celled microscopic parasite that only infects northern hard clams (*Mercenaria mercenaria*), identified as Quahog Parasite Unknown and creating "QPX disease."



Lesions appear as white areas dotted with round clusters of QPX cells in this stained section of a hard clam siphon. Digital image by **Soren Dahl** as appears in *Journal of Shellfish Research,* August 2007. Reprinted with permission.

"The transplant program was immediately terminated on September 6, 2002, to prevent the potential introduction of the parasite to the cleansing sites and waters of Peconic Bays," says Barnes. She added that the shutdown of the program had devastating economic impacts on the program participants and permit holders who relied on this program for a significant portion of their income. "QPX disease affected almost 10,000 acres in Raritan Bay and was conservatively estimated to result in mortality of millions of hard clams."

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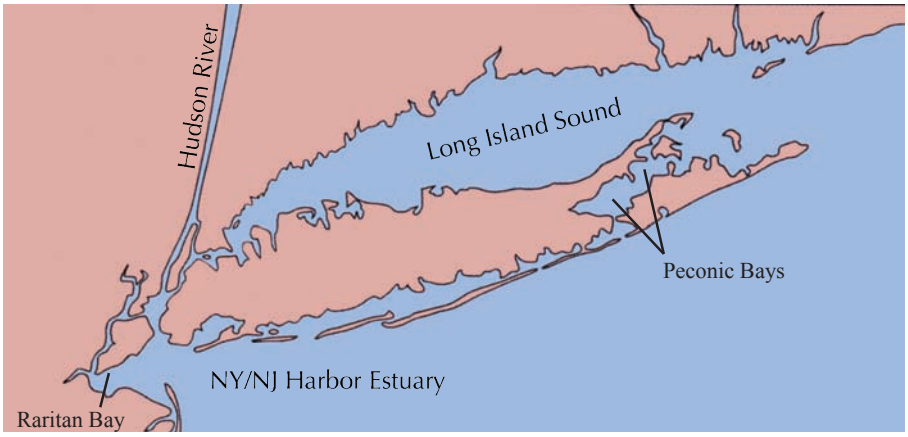
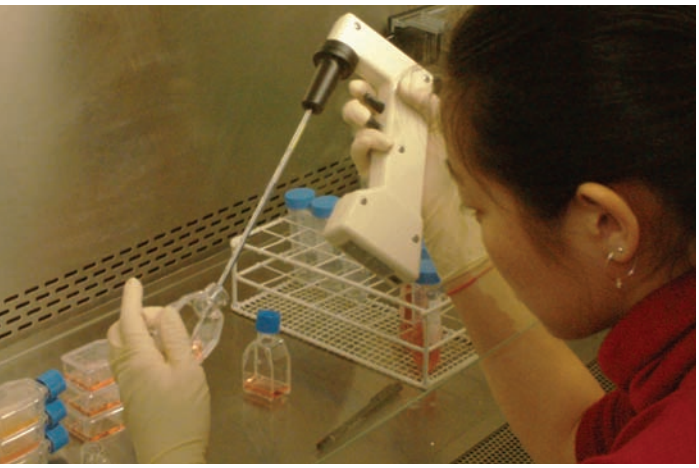
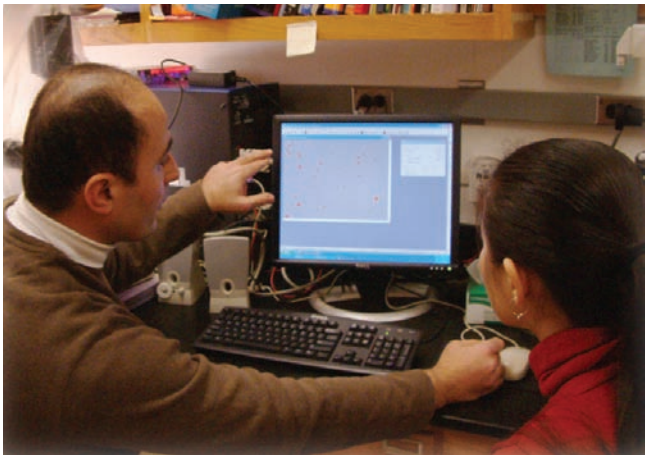


The NYSDEC Transplant Program taking clams from Raritan Bay to Peconic Bays was one of the most successful in the state until QPX caused clam mortalities in 2002. The program resumed in 2005.





Above, Sea Grant Scholar Qianqian Liu is transferring QPX culture. Isolating and maintaining the QPX parasite in living culture is crucial for most investigations of the disease. Using a digital camera, Bassem Allam and Qianqian Liu (at right) examine the quality of growth of the laboratory culture.

Since the closure, the NYSDEC and the Marine Animal Disease Laboratory (MADL) at Stony Brook University have developed and conducted an extensive QPX monitoring program in Raritan Bay, Peconic Bay and other areas of the marine district to determine the extent and distribution of QPX disease. Barnes notes that the transplant program remained closed until May 2005, when the NYSDEC re-opened 25 percent of Raritan Bay to transplant harvest based on the results of QPX monitoring, which found "null or low prevalence of QPX in hard clams collected from these areas."

QPX disease had caused mortalities in both cultured and wild populations of *Mercenaria mercenaria*, or hard clams, in the northeast in the 1990s. As its moniker suggests, little was known about this pathogen, a protistan parasite. A recent New York Sea Grant-funded study partially supported by NYSDEC, which has provided insight into the pathobiology of this parasite, may lay the groundwork for restoring the hard clam to health, as well as the industry itself.

This published work, titled "Laboratory Transmission Studies of QPX Disease in the Hard Clam: Development of an Infection Procedure," can be read in the *Journal of Shellfish Research*, August 2007 issue. The article, written by MADL team leader **Dr. Bassem Allam** and Sea Grant Scholar **Soren Dahl**, was based on Dahl's master's thesis. The article concludes, "This study has established an experimental infection method that can be used for future investigations concerning crucial aspects of the QPX/hard clam disease system." The investigators call this a major advance in the investigation of this important disease.

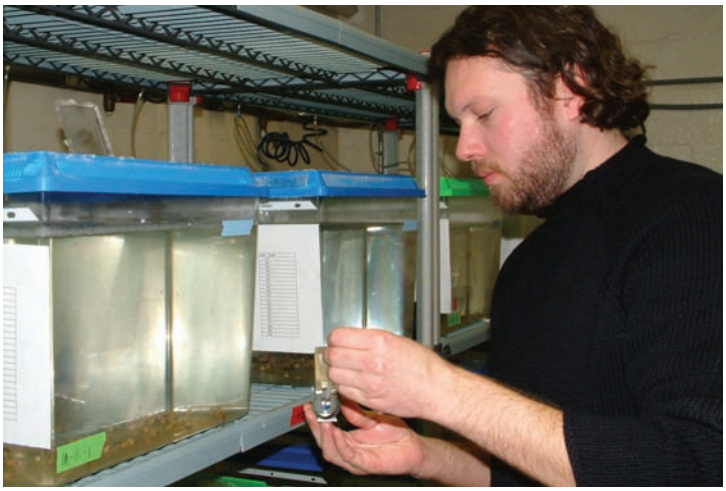
The main purpose of this NYSG-funded research was to investigate the ways the disease can be transmitted to clams and to replicate infection under laboratory conditions. Two different methods were used: cohabitation and inoculation.

For the cohabitation experiments, the research team used adult clams from sites where there have been QPX outbreaks–Raritan Bay (Staten Island, NY) and Cape Cod (MA). The infected adults were placed in with 2,400 seed clams from four different locations supplied by partners from Virginia Institute of Marine Science (VIMS) and Woods Hole. A control placed similar seed clams in seawater but without the infected clams. Over a year, mortality counts and histology samples were taken periodically. The results? The presence of infected clams did not cause disease in juveniles, which suggests that it takes more than just close habitation for transmission to occur.

However, the results from the inoculation experiments showed that QPX is a directly infective pathogen, as injection of cultured cells leads to infection and mortality. The experiments used year-old clams, some inoculated with a needle containing QPX and others merely exposed to QPX in the water column. When analyzed, the researchers found that a majority of inoculated clams had the disease, but not the clams exposed to the pathogen via the water. Although clams in the wild don't get the disease by inoculation, the lesions and other signs of the disease in the experiemental clams were the same as those observed in wild stocks.

The cohabitation experiments brought some unanticipated observations, too. "It was a very big surprise," says Allam. "We found that many heavily infected clams in the lab healed. There, we were controlling temperature, salinity and oxygen, however in the field there are fluctuations of these variables." For the naturally infected clams, the laboratory environment with its steady conditions may have been advantageous, promoting healing and resistance.

This observation is encouraging and may help to identify ways to manage or remediate clams infected



Sea Grant Scholar Soren Dahl examines water quality of the tanks holding experimental clams.
Photos by Paul C. Focazio

with QPX. Ultimately, environmental conditions could prove to be significant considerations in QPX disease mitigation.

"We work hand in hand with the state," says Allam. "Perhaps we can help find ways to transplant clams into bodies of water at an optimal, likely higher, temperature to promote clam health."

Barnes says that the diagnostic and research work conducted by MADL and funded by NYSG "plays a critical role in providing information needed for management and protection of the state's marine resources" and that the NYSDEC's important partnership with the MADL has enabled the agency "to obtain information on the distribution and prevalence of QPX in Raritan Bay and other locations in the marine district, which is vitally important for the management of these resources and support of our shellfish industry."

"I think the results of the research provide significant information on some of the unknowns about QPX transmission and also confirm the theory of QPX being a directly infective pathogen (opportunistic parasite)," says Barnes. "I was surprised by the laboratory results of the cohabitation experiments when they showed that QPX did *not* transmit from diseased adult clams to non-infected clams when held within the same tank."

Barnes notes that although these research findings will not likely change New York's shellfish transplant policies for the short term, "the results will be incorporated into the state's QPX monitoring program in order to maximize the harvest areas available for shellfish harvesters and at the same time minimize the risk of transmission to our natural clam resources." She adds that the results could also be used by town shellfish managers and private aquaculturists to develop Best Management Practices for hard clam restoration and culture.

What are the next steps? Other complementary research projects have already begun to examine variables like temperature, density and possible vectors that may cause disease transmission. The role of substrates (sediments or plants) that could possibly support the QPX pathogen outside of the clam was not incorporated into the inoculation experiments. Earlier in 2007, Stony Brook grad student **Deenie Bugge** (now at Dartmouth College) found that algae might be an important factor for the survival, growth and spread of QPX in the marine environment. A new line of research will now examine the possible role of sediments in transmission. Yet another project will examine the immune system of clams.

So can Allam and his team say that they've taken some of the X out of QPX by this series of experiments? "Yes," says Allam. "We haven't concentrated so much on the 'what' of this disease, but we have learned much about the 'how' of its transmission."

More on those unknowns is being filled in with the help of co-PI **Dr. Jackie Collier**. As reported in the September 2007 issue of *Diseases of Aquatic Organisms*, the research team, including Sea Grant Scholars **Hua** (Daisy) **Qian** and **Qianqian Liu**, examined a variable part of the QPX genome and found the same sequences in naturally infected clams as in experimental cultures of QPX. They have since used this information to develop a real-time polymerase chain reaction method that can be used to detect and enumerate the QPX organism in environmental samples and in hard clams. This new method is giving the team a new way to investigate the development of QPX disease in hard clams. These results will be described in research papers to be published soon. Stay tuned.

— Barbara A. Branca and Lynn Zawacki

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... for more photos of clam experiments and NYSG's 2003 brochure *QPX Disease in Hard Clams — Quahog Parasite Unknown*

HISTORY OF THE QUAHOG

Chowders, cherrystones, littlenecks–seafood lovers find these tasty, nutritional hard clams irresistible. For most of the twentieth century, the hard clam or northern quahog has been one of the most valuable seafood products harvested in New York.

Commercial harvesters dig for hard clams in shallow coastal bay waters in areas with a soft sandy bottom. But dig a little deeper into American history and you'll find that the hard clam was also valued by Native Americans and that it played a part in the economy of the colonies.

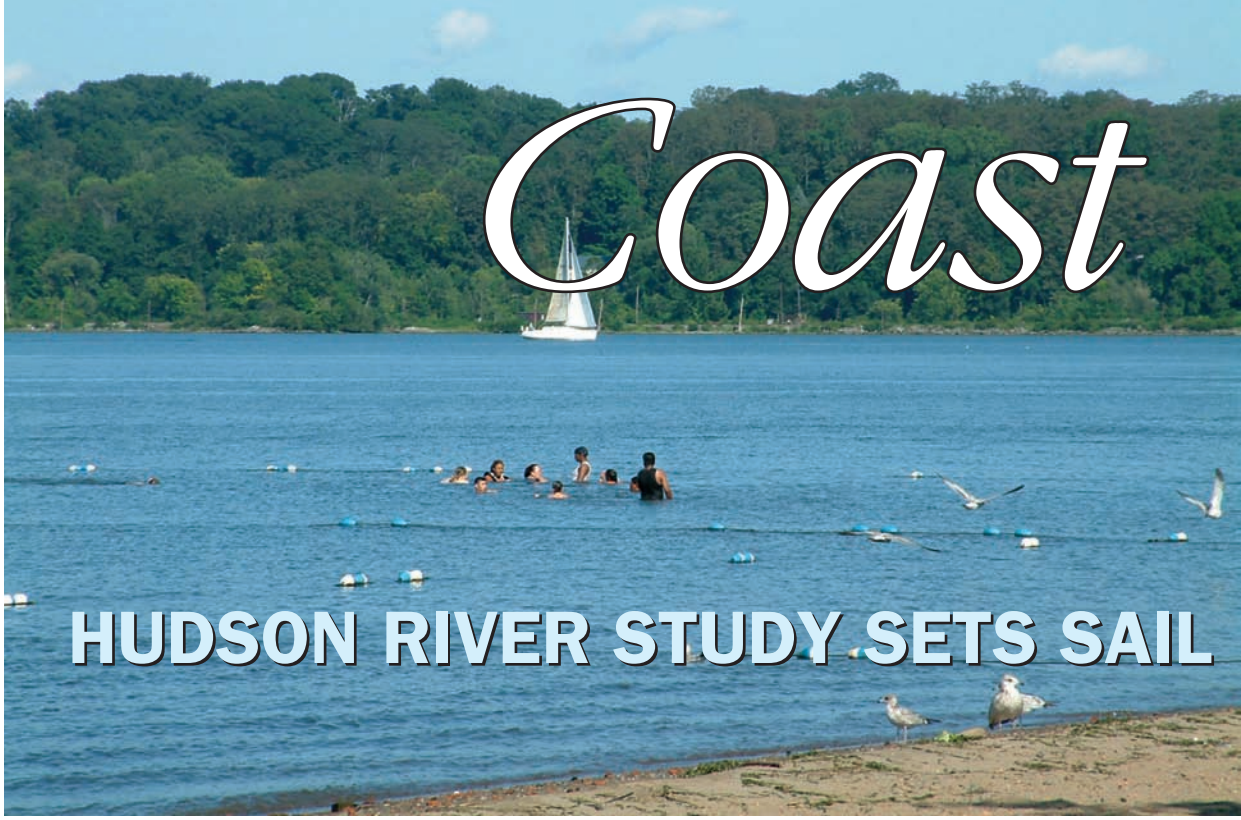
Native Americans collected oblong shells, which they polished and sawed into beads known as wampum (wampumpeag). The small, tubular beads were made of white or purple seashells; purple wampum beads were made from the growth rings of the Quahog shell. The beads were assembled into strings or woven into belts or embroidered ornaments. Wampum was valued because of the labor and skill it took to make. Indians used wampum for ceremonial purposes, oral traditions or as gifts, but not as currency.

In the early 1600s, however, European traders and settlers faced with a shortage of European currency turned to wampum beads as coin substitutes. It was used as legal tender in the original colonies, and the last recorded exchange of wampum as money was in New York in 1701.

— Lynn Zawacki

Coast

HUDSON RIVER STUDY SETS SAIL



Bathers and sailors alike enjoy Kingston Point. Photo by Barbara A. Branca

A welcoming Jen Baker at the Kingston Visitor's center (above).
Photo by Barbara A. Branca

It's a warm sparkling Saturday in the Hudson Valley. Residents and tourists alike are out kayaking, windsurfing, motor boating, fishing and even swimming along New York's most famous river. People are launching kayaks in Kingston or antiquing in Cold Spring, or gallery hopping in Beacon. Or is it hiking in Constitution Marsh near Cold Spring, shopping for antiques on Beacon's Main Street or enjoying a Riverfront festival in Kingston? The choices are many and these three Hudson Valley communities are interested in finding out just what it is that gives each its unique character that residents and visitors find so appealing.

This summer, these communities got some help. At each tourist destination there's a good chance that a friendly graduate student like **Jennifer Baker** or **Laura Sullivan** might have approached a group of summer visitors and asked them to fill out a survey to identify what makes each tourist destination so attractive. That's the way researchers **Drs. Rudy Schuster** and **Diane Kuehn** of the State University of New York's College of Environmental Science and Forestry are helping to find the best ways to promote river related tourism in the Hudson River Valley. In their New York Sea Grant funded project, this team, assisted by Penn State University's **Duarte Morais**, is analyzing the attributes that residents and visitors have identified as characterizing each community.

"With nature-based and heritage tourism both increasing in popularity in the Hudson Valley, many coastal communities face challenges in retaining stable local economies," says Schuster. "Our aim with this research is to help characterize for these communities the distinct image that represents their

Visitors fill out the survey along Beacon's Main Street (bottom left).
Photo by Barbara A. Branca

Others enjoy the paddle to Bannerman's Island, accessible from both Beacon and Cold Spring (bottom right).
Photo by Rudy Schuster

Watch

unique social, cultural and environmental qualities in sustainable tourism development."

This 'destination image' will provide usable information about the attributes of the natural environment and tourism opportunities that identify the destination as similar or unique in relation to other Hudson destinations–and that tourists find attractive.

"Understanding which attributes of the nature and heritage tourism experience are attractive and valued by tourists will facilitate marketing efforts, increase visitation and enable market positioning among these communities," says Morais. "I think the most exciting thing about this project is that we're going from social science theory all the way down to application in one project," adds Schuster.

And most importantly, this project will help identify what characteristics support sustainability of the local character in the eyes of local residents. "The level of excitement of the local communities about getting this information really makes this a meaningful project to us in science as well as on the ground," says Schuster.

Schuster, Kuehn and Morais will be listening to the voice of the local communities as they generate a report that takes into consideration and serves the interests of host populations. Perhaps the engagement of the three host communities of Kingston, Beacon and Cold Spring may act as a catalyst for further image branding in other nearby communities.

"As Hudson River communities are revitalized through increased public access and recreation opportunities," says NYSG's Hudson Estuary Specialist **Nordica Holochuck**, "these cities, towns and villages need information that can guide tourism planning and also preserve the scenic beauty, open spaces and relative tranquility valued by residents and visitors alike. This research project can help."

Once the survey data are analyzed over the coming months, the researchers will present their findings to the communities.

— Barbara A. Branca and Paul C. Focazio

Cold Spring offers visitors good spots for dining, shopping and fishing.
Three photos below right by Barbara A. Branca

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... for a photo gallery of Hudson River tourism sites used in this study

NYSG's Nordica Holochuck explores the variety of shops on Beacon's Main Street (bottom left).
Photo by Barbara A. Branca

Visitors have many choices for lunch in Kingston (bottom right).
Photo by Rudy Schuster

Dr. Paul Bowser (left, alongside Postdoctoral Associate Geoffrey Groocock), analyzes samples of several fish internal organs affected by VHSV. "The virus is very unstable," he says. "If fish are collected by a field biologist in a remote location, and they are not properly refrigerated, the virus will decompose by the time it reaches the lab."
Photo by Jason Koski, Cornell University Photography

VHS: THE ANATOMY OF AN EMERGING VIRUS

This past January, NYSG's Fisheries Specialist **Dave MacNeill** convened a meeting in Watertown to discuss a disease of immediate urgency in the Great Lakes – a disease known as VHS, viral hemorrhagic septicemia. "Our recreational and commercial fisheries are a vital part of New York State's economy," says MacNeill, "and VHS poses a potentially serious threat to the fisheries and to the businesses dependent on them." At the meeting, elected officials obtained firsthand accounts of VHS effects on freshwater fish and the economic loss and burdens on small businesses in upstate NY. Then, the elected municipal and state officials met with federal legislators–including staff in U.S. Senator Hillary Clinton's and Congressman John McHugh's offices – and APHIS, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service.

In May, NYSG's other Fisheries Specialist **Antoinette Clemetson** coordinated a seminar on Long Island to educate representatives in the bait and tackle industry about management actions being undertaken in response to the VHS disease outbreak in the Great Lakes. "An outbreak of VHS in our marine waters would be disastrous to businesses dependent on sport and commercial fishing," says Clemetson.

At the January meeting, participants discussed options for obtaining low interest emergency loans as economic assistance to mitigate problems being experienced by VHS-impacted businesses, as well as a mechanism for cross-border transport of fish for processing. Industry representatives at the May meeting offered several suggestions that were used to streamline the NYS Department of Environmental Conservation's set of regulations to create new standards for fish health inspection and restrict movement of uncertified bait fish within New York. "We're trying to make anglers aware of the new regulations developed to halt movement of the VHS pathogen into new water bodies," says Clemetson. "Anglers need to familiarize themselves with the disease symptoms and report incidents of infected fish to the DEC."

Of course, detection of the VHS virus (VHSV) is best left up to the researchers. So, in February, NYSG awarded **Dr. Paul Bowser**, Professor of Aquatic Animal Medicine at Cornell University's College of Veterinary Medicine, a two-year, $178K grant to develop a genetics-based test to detect VHSV in both tissues and water samples. The grant will also be used to study optimal ways for handling study specimens and to examine the virus' stability in fresh and

@nyseagrant.org **... for more Q&A on how VHSV affects fish species differently and details on Bowser's NYSG project and research partners. Also, NYSG's Antoinette Clemetson summarized the DEC's VHS-related regulations enacted this past June**

turbid water to determine if these conditions affect the diagnostics.

In an interview with *Coastlines* editor **Barbara A. Branca**, Bowser explained the technique he and his lab are developing to more rapidly detect VHSV, what the virus is and why it has such a profound effect on fish.

Q: Dr. Bowser, what is this virus and does the name refer to its effect on fish?

A: VHS is a rhabdovirus–a bullet-shaped RNA virus–one that's adapted to cold blooded animals, particularly fish. It is not a threat to human health in any way. The name describes what it does–VHSV creates hemorrhages. The virus destroys the cells that line various blood vessels in the fish and causes bleeding. Bleeding destroys internal organs, such as the heart, liver, spleen and kidneys, and eventually the fish dies.

Q: Which fish species seem to be most affected and how does the virus manifest itself?

A: We've seen significant mortality events occur in several species: muskellunge [a kind of pike], round gobies, gizzard shad, smallmouth bass and freshwater drum. Sometimes I'm asked the question, "How bad can it get?" Well, although not everything happens to this degree, the graphic description of the freshwater drum kill that occurred last year on the shores of Lake Erie says it all. There were windrows of fish covering the length of the beach, piled up about 10 feet wide and 4 feet tall. That was an unusual event and it was probably due to a combination of the fish being particularly susceptible to the virus and maybe some other environmental stressors, possibly high temperatures. We don't always see the situation being that serious or severe, but there is potential.

Q: Stressors definitely seem to be playing a role in the mortalities. Although it appears not to harm humans, VHSV has a history of affecting fish – it has been reported in Europe as far back as 1938. So, why is it showing up now in the Great Lakes? And what's this newer, virulent strain in the Northwest Atlantic? Is it the result of ballast water introductions or viral mutations?

A: Historically there have been instances of the VHS virus in freshwater-reared rainbow trout dating back into the 1930s. To this day, the virus remains the most serious viral pathogen of trout in Europe. Over the years, there have been a number of genotypes of the virus found on a worldwide basis. Genotypes I, II, and III are found in Europe and Japan. Genotype IV is found in North America's Pacific Northwest and off the Atlantic coast in maritime Canada as well as in Japan and Korea. The isolate that first emerged in the Great Lakes in 2005 is genetically most closely related to the North American Genotype IV. But it's different enough that those who do the genetic studies of the virus are now calling the Great Lakes isolates Genotype IVb and terming what was previously only found in the marine environment Genotype IVa.

continued on page 14

Though it may appear healthy, infected fish like the muskellunge held here by Dr. Paul Bowser are confirmed via tissue cultures. Bowser's current NYSG research grant focuses on muskellunge fisheries, the second most important sportfish in NYS, in the St. Lawrence River, Chautauqua Lake and the Niagara River. Photo courtesy of Paul Bowser, Cornell University College of Veterinary Medicine

WHAT IS A VIRUS?

"A virus, in a nutshell, is a little package of either RNA or DNA that completely depends upon a host (fish in this case) to replicate and survive. In the case of VHSV, it is an RNA virus," says Bowser.

"Think of a virus as the ultimate parasite. It must get inside a cell in order to survive in the environment for any extended period of time."

"Once inside the cell, the virus essentially takes over the metabolic machinery of the cell. It tells the cell, 'Okay, we're not going to do cell stuff anymore. We're going to do virus stuff now.'"

"In some cases that virus will, by the infection of the cell, cause a destruction of the cell," Bowser continues. "In other cells, it acts as a silent infection and doesn't cause the destruction of the cell."

"Although vaccination strategies are working for this type of virus, there currently is no effective way to vaccinate fish in the natural environment [such as the Great Lakes]," adds Jim Casey, Cornell University Associate Professor of Veterinary Microbiology and Immunology.

So, any measure to control the spread of VHS, he says, requires people to "apply procedures that existed prior to the discovery of vaccines, such as monitoring outbreaks and trying to isolate fish so they don't spread the disease."

Q: Fish have immune systems, so why are they so vulnerable to this virus?

A: The virus is an RNA virus. RNA viruses as a group, have a tendency to make genetic errors, or mutations, when they replicate [see sidebar page 13]. The genetics tend to suggest that this virus may have originated from the Genotype IVa found in the marine environment and somehow that virus moved into the Great Lakes. And, why are we having a problem now? There is a great deal of talk [in the science community] about new and emerging diseases where you have a new pathogen that moves into an environment and there are a number of host species that were never exposed to this pathogen before. So you have disease events that appear to be very serious in the beginning. And that's probably what we're seeing right now. You can almost liken it to–and, again, I have to emphasize that this is not a human pathogen–what we see with the human Influenza virus, where every 20 or 30 years there is a major change in the genetic type of the flu virus. And more people are sick and those people who do become sick may be affected more seriously. This is probably what we are seeing with the VHS virus in that we have the new pathogen and naïve hosts. And, that combination has resulted in a serious disease event.

Q: The future, Dr. Bowser. You've worked with several fish diseases in your NYSG-sponsored research – botulism in fish and fish-eating birds, swim bladder sarcoma. These are important and destructive diseases. How does this particular disease compare in scope and severity?

A: I agree with many of my colleagues in the fish health field who view the emergence of VHS in the Great Lakes basin as one of the most serious, if not *the* most serious fish health event that has ever occurred in North America. I say that because of the diversity of fish species that are being infected and the degree to which the disease has impacted sportfisheries management. Importantly, although the virus has not yet been found in a North American aquaculture facility, should that happen as it has in Europe, there could be devastating economic consequences. So, we consider invasion of VHSV into the Great Lakes as a very serious infectious disease event and something that needs significant research to understand and formulate ways to prevent its spread and limit its impact.

— Paul C. Focazio and Barbara A. Branca

Outbreaks of Viral Hemorrhagic Septicemia in the Great Lakes 2005 – 2006

DATE	**2003-05**	**Summer '05**	**May '06**	**May '06**	**May '06**	**May '06**	**May '06**	**June '06**
LOCATION **STATE OR PROVINCE**	Lake St. Clair **MICHIGAN**	Bay of Quinte / Lake Ontario **ONTARIO**	Sandusky Bay/ Lake Erie **OHIO**	St. Lawrence River **NEW YORK**	Lake Erie **OHIO**	Lake Erie **OHIO**	Lake Ontario **ONTARIO**	Lake St. Clair **MICHIGAN**
PRIMARY SPECIES (OTHER SPECIES)	**Muskellunge**	**Freshwater Drum** (Muskellunge, Round Goby)	**Freshwater Drum**	**Round Goby** (Muskellunge)	**Yellow Perch Walleye White bass** (Freshwater Drum Smallmouth Bass)	**Yellow Perch**	**Freshwater Drum Smallmouth Bass Bluegill Crappie**	**Gizzard shad Redhorse sucker Blunt nose sucker Northern pike** (Yellow perch)
ESTIMATED MORTALITY	**4 of 27**	**Several hundred tons**	**Very large mortality**	**Large die off**	**Mortality in wild**	**Large die off**	**Mortality event**	**Large mortality**
COMMENTS	*Samples submitted over several years*	*Very large natural mortality*	*"Windrows" of fish on beach*	*River origin*	*Samples from area of traps and mortality*	*Fish dying in commercial traps*	*Acute mortality - no external signs*	

Modified from: *Viral Hemorrhagic Septicemia in the Great Lakes*. U.S. Department of Agriculture/Animal and Plant Health Inspection Service – Veterinary Services. July 2006 Emerging Disease Notice.

Field testing the first version of Go Fish! turns the heads of these third graders from Q148 in Queens. NYSG's Nim Lee was one of several artists who worked on the Go Fish! cards. She created the artwork for the summer flounder. Photo by Nim Lee

GO FISH! GAME TEACHES LOCAL BIODIVERSITY

The I FISH NY program visits school children in New York City and Long Island to teach kids about fish and fishing. When **Sarah Bruner**, a fisheries technician for New York State Department of Environmental Conservation(NYSDEC) joined the I FISH NY-NYC team led by **Nim Lee**, a NYSG Recreational Fisheries Specialist, they immediately started brainstorming about how to expose kids to the diversity of local fish species. Their basic requirement: make learning fun and local; the result: the **Go Fish!** card game.

Nim and Sarah spun the classic kids' game by replacing numbers with family names of fish represented in New York State fresh or salt water: herring, sucker, bass. Each family has four different representative species (one for each suit). Most of the freshwater fish came from NYSDEC commissioned artwork from the 20's and 30's and the bulk of saltwater species was generously provided by the Florida Fish and Wildlife Conservation Commission. Nim and several other artists also contributed artwork, while Sarah designed the card backs, putting an urban twist to the classic card design.

Kids embraced the game, expressing a range of emotions not usual during a typical lesson. One student exclaimed while jumping out of his seat, "I've got four families. I'm on fire!" Others chuckled while asking fellow students, "Do you have any suckers?" Kids learn through playing Go Fish! that, while hard to see, New York State fish have names and lots of them.

Complimentary decks are available for educational purposes only. Send inquiries to Nim Lee at CL432@cornell.edu or call 718-482-4940.

— Nim Lee, NYSG Recreational Fisheries Specialist

SETTING THE RESEARCH AGENDA

continued from page 3

The product of the May 2007 workshop is a list of key management, monitoring, and research projects that should facilitate and steer our efforts. The top actions in each of those categories are: establishing a working group for coordination and information sharing, monitoring the physical conditions of existing seagrass beds, and testing multiple stressors such as light and sulfide, and root penetrability of hard surfaces.

A full report from the seagrass workshop will be available by December 2007. Look for it on NYSG's Web site.

— Barbara A. Branca, Jack Mattice and Cornelia Schlenk

@nyseagrant.org

... for photos from the seagrass workshop and images and animations of seagrass

Currents

NYSG's Mary Penney (far right), her Dune and River Stewards and members of the Oswego County Soil and Water Conservation District were joined by around a half dozen Entergy employees for Habitat Restoration Day at Deer Creek Marsh WMA.
Photo courtesy of Mary Penney

HABITAT RESTORATION DAY

It's a balmy Friday morning in early August and help is on the way for the eight students in the Eastern Lake Ontario Dune and Salmon River Steward Program. By noon, about 500 feet of snow fencing will be installed along the dunes at Deer Creek Marsh Wildlife Management Area (WMA). Deer Creek Marsh WMA is the southernmost of four public lands along a 17-mile stretch of Eastern Lake Ontario dune and wetlands area–and the closest to the Salmon River corridor–that the stewards frequent to encourage public appreciation and proper recreation enjoyment.

At 9 a.m., around a half dozen Entergy Nuclear Corp. employees filter in to help make Habitat Restoration Day a reality. Why? In June, Entergy provided a $10,000 grant to the Oswego County Soil and Water Conservation District on behalf of the Steward Program to assist them in their efforts to protect the area. "As a result of our efforts today,

An Entergy volunteer (in black) and three Lake Ontario dune stewards–Danielle Lichtenstein, Ben Robedee, and, far right, Tyler Kukko–put the finishing touches on a new string of snow fencing along Deer Creek's sand dunes. Kukko, a sophomore at SUNY ESF, will help develop a guidebook for the Deer Creek Marsh WMA.
Photo by Paul C. Focazio

an entire stretch of sand dunes will be protected," said Entergy employee **Tammy Hadlow** to an on-site staff reporter from Oswego's *The Palladium Times*. NYSG's **Mary Penney**, who manages the Steward Program, explained to the reporter the importance of the lakeshore's sand dunes.

Deer Creek's dunes guard the wetlands, creeks and local communities from harsh westerly winds and storm energy sweeping over the Lake, thus also helping to maintain the biodiversity of the area's various habitats. Penney cautions, "If the mature dunes at Deer Creek become damaged, it is unlikely that they would be able to return to their current healthy condition because little to no new sand is being added to the system here."

In addition to covering the costs of necessary materials for the habitat restoration efforts, Entergy will fund the development of a dune trail interpretive guide for Deer Creek Marsh WMA. "We'll use the guide to help promote environmentally sound use of Deer Creek and nearby parts of the fragile ecosystem that form the Eastern Lake Ontario Dunes and Wetlands Area," says Penney. Dune Steward **Tyler Kukko**, who will help develop the guide, adds, "I feel people will be more environmentally-friendly here at Deer Creek if they know how fragile and important the dunes are. This new guide will showcase the resources here."

This effort is the beginning of a funding stream many supporters of the Steward Program hope continues. "The program is working wonderfully well in educating the public on respecting and saving these fragile dunes," says **Margaret Kastler**, Town Supervisor of Sandy Creek, a northern public area neighbor on the lakeshore. "The continuation of the Steward Program is vital in the protection of Lake Ontario's dunes, one of the attractions that bring people to these areas to bird watch, walk our beaches and enjoy our gorgeous sunsets."

— Paul C. Focazio

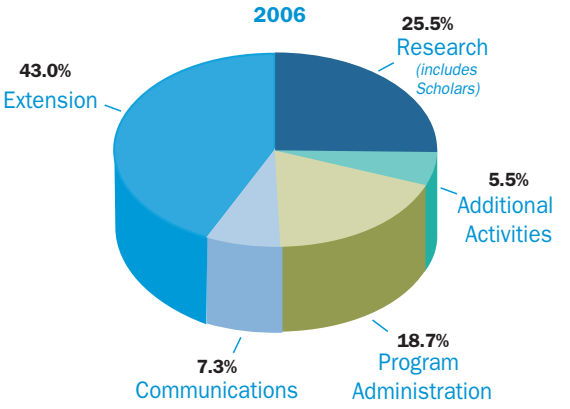
@nyseagrant.org

... for more on the event, plus pictures and articles from the stewards, as well as maps of the Eastern Lake Ontario dune system and Salmon River corridor

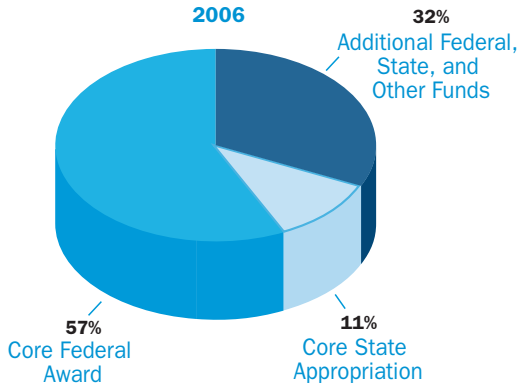
Dune and Salmon River Stewards worked alongside Entergy volunteers to make Habitat Restoration Day a success.
Photo by Paul C. Focazio

Annual Report

DISTRIBUTION OF FUNDING AMONG PROGRAM ELEMENTS



FUNDING SOURCES



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

NEW YORK SEA GRANT

State, Federal, and Other* Funds Allocated in Calendar Year 2006 for use in 2006 and beyond

Program Administration

From NSGO (core) and New York State (core and/or member items)	$756,038
From NSGO initiatives and national investments	$0
From other sponsors	$82,982
Total Program Administration	**$839,020**

Communications

From NSGO (core) and New York State (core and/or member items)	$306,159
From NSGO initiatives and national investments	$0
From other sponsors	$21,034
Total Communications	**$327,193**

Extension

From NSGO (core) and New York State (core and/or member items)	$837,788
From NSGO initiatives and national investments	$65,115
From other sponsors	$1,029,601
Total Extension	**$1,932,504**

Research and Graduate Student Scholars

From NSGO (core) and New York State (core and/or member items)	$1,089,760
From NSGO initiatives and national investments	$57,100
From other sponsors	$0
Percent of above research funds allocated to Scholars	28.20%
Total Research and Scholars	**$1,146,860**

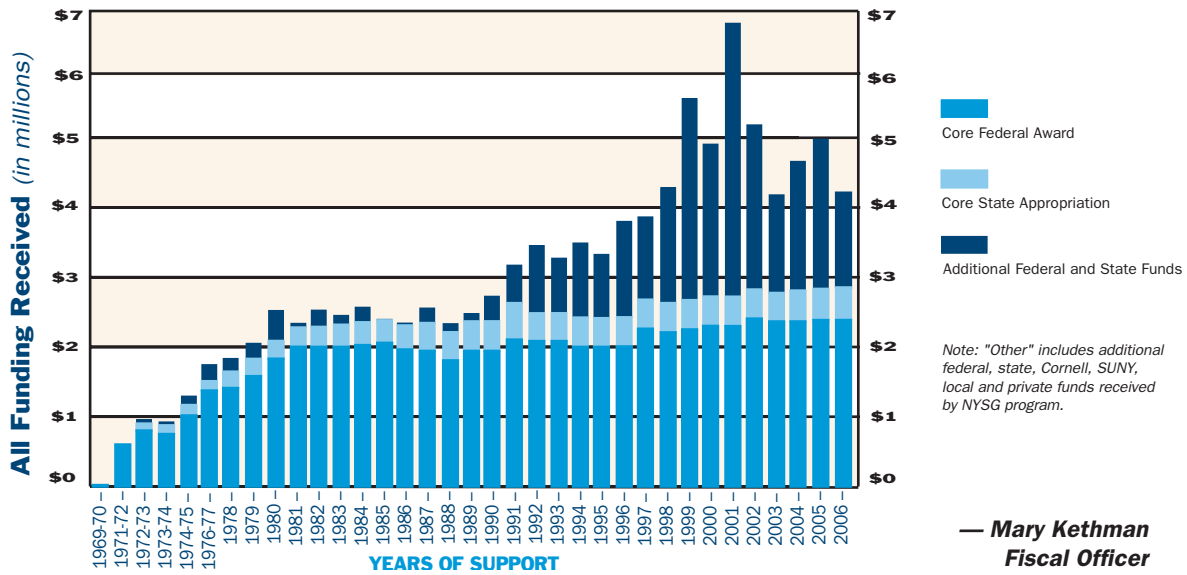
Additional Activities

From NSGO (core) and New York State (core and/or member items)	
— Fellowships	$16,800
— Other Conferences/Workshops/Special Projects	$67,324
From NSGO initiatives and national investments	
— Fellowships	$114,667
— Other Conferences/Workshops/Special Projects	$644
From other sponsors	
— Fellowships	$50,459
— Other Conferences/Workshops/Special Projects	$0
Total Additional Activities	**$249,894**

Total Funds Allocated	**$4,495,471**
Unallocated and Pending Committed Funds Carried into 2007**	**$279,472**
Additional Non-Federal Cost-Sharing or In-Kind Support (not already included as direct support in table above)	**$1,358,213**

Note: NSGO = National Sea Grant Office
**"Other" includes funds provided by Cornell, SUNY, local and private sources*
***Includes funds committed to continuation of specific projects/activities, and projects slated to begin in 2007*

NEW YORK SEA GRANT FUNDING *(Since Inception)*



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

— Mary Kethman
Fiscal Officer

LAST WAVE

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Are you wired?

How do you receive information about your coastal community? Do you read your local newspaper or watch TV? Or perhaps you consume articles and blogs on the Web.

New York Sea Grant is using hard copy to deliver this issue of *Coastlines* to you, but we also archive back issues since 1998 on our Web site www.nyseagrant.org and are considering a move mainly toward electronic publication.

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Mercenaria mercenaria

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Stony Brook, NY 11794-5001/631.632.9124

Journal Reprints

A fluorometric technique for the *in vitro* measurement of growth and viability in Quahog parasite unknown (QPX). D.M. Buggé and B. Allam. 2005. *Journal of Shellfish Research* 24(4): 1013-1018. Pub ID# 2955. *Free*

Laboratory transmission studies of QPX disease in the hard clam: Development of an infection procedure. S. Dahl, and B. Allam. 2007. *Journal of Shellfish Research* 26(2): 383-389. Pub ID# 3127. *Free*

Molecular characterization of potential microcystin-producing cyanobacteria in Lake Ontario embayments and nearshore waters. A.M. Hotto, M.F. Satchwell, and G.L. Boyer. 2007. *American Society for Microbiology* 73(14): 4570-4578. Pub ID# 3129. *Free*

Molecular genetic variation within and among isolates of QPX (*Thraustochytridae*), a parasite of the hard clam *Mercenaria mercenaria*.H. Qian, Q. Liu, B. Allam, J.L. Collier.2007. *Diseases of Aquatic Organisms* 77: 159-168. Pub ID# 3134. *Free*

The effects of temperature and predator-prey interactions on the migration behavior and vertical distribution of *Mysis relicta*. B.T. Boscarino, L.G. Rudstam, S. Mata, G. Gal, O.E. Johannsson and E.L. Mills. 2007. *American Society of Limnology and Oceanography* 52(4): 1599-1613. Pub ID# 3128. *Free*

The influence of plankton composition and water quality on hard clam (*Mercenaria mercenaria* L.) populations across Long Island's south shore lagoon estuaries (New York, USA). M.B. Weiss, P.B. Curran, B.J. Peterson, and C.J. Gobler. 2007. *Journal of Experimental Marine Biology and Ecology* 345(1): 12-25. Pub ID# 3076. *Free*

Use of a 600 kHz acoustic doppler current profiler to measure estuarine bottom type, relative abundance of submerged aquatic vegetation and eelgrass canopy height. J.D. Warren and B.J. Peterson. 2007. *Estuarine, Coastal and Shelf Science* 72(1-2): 53-62. Pub ID# 3070. *Free*

Zooplankton changes associated with grazing pressure of northern quahogs (*Mercenaria mercenaria* L.) in exceptional mesocosms. D.J. Lonsdale, R.M. Cerrato, D.A. Caron, and R.A. Schaffner. 2007. *Estuarine, Coastal and Shelf Science* 83(1-2): 101-110. Pub ID# 3079. *Free*

BLACKFISH TRIVIA

Blackfish, or tautog, are found from Nova Scotia to South Carolina and are most abundant between Cape Cod and the Chesapeake Bay. These saltwater fish, in the wrasse family, live both in near shore coastal waters as well as offshore. Wrasses have teeth that can grind food almost to the consistency of fine sand that you'd find on coral beaches of the tropics. This clever adaptation assists these fish to digest shellfish, mollusks, crustaceans, and, tropical wrasses forage on live corals, too.

Our local wrasse, the blackfish, has another unusual feature. Mature (and very old) males have a prominent forehead (almost square-shaped) when compared to females. When genders of the same species have distinct physical appearances (also referred to as sexual dimorphism), this unique trait may give the wrong impression that a fish belongs to an entirely different group.

For information about its availability and nutritional value, check out this issue's "web extras" at

nyseagrant.org

— Antoinette Clemetson and New York Seafood Council

Bringing Science to the Shore

SEAFOOD CORNER

Long Island Fisherman Stew

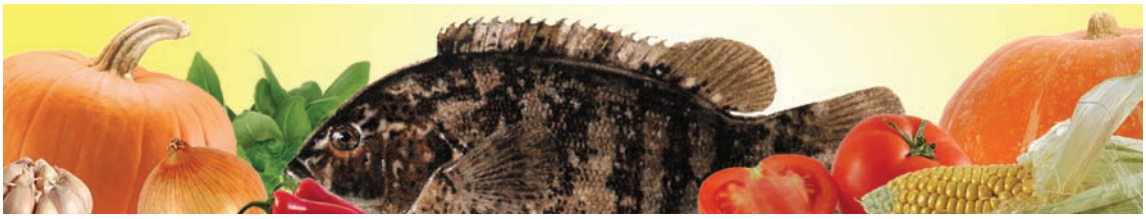
Ingredients

2 lbs. blackfish fillets
1 tbsp. margarine or butter
1 cup onion chopped
1 clove garlic, crushed
2 cans tomatoes, undrained, cut-up (each can should be 1 lb. or 16 ozs.)
3 cups water
1 tsp. basil
1 tsp. thyme
1/4 tsp. red pepper, crushed
1 tsp. salt
4 cups pumpkin or winter squash, cut into 1 inch cubes
2 ears corn, cut crosswise into 1 inch pieces

Method

Cut fish fillets into 1 to 2 inch pieces. In a large saucepan melt margarine. Add onion and garlic and cook until tender. Add tomatoes, water, basil, thyme, red pepper, salt, pumpkin and corn. Cover and bring to a boil. Simmer for 10-15 minutes or until pumpkin and corn are done. Add fish and continue to cook for 5-10 minutes or until fish turns opaque and begins to flake when tested with a fork.
Serves 4 to 6.

Source: Adapted from the Gillectible Gourmet's Guide to Long Island Seafood



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