# COASTLINES

## New Wave of Research



Photo of Long Beach by Frank S. Buonaiuto

The awesome power of the Atlantic's waves pounding the beach can be experienced by beachcombers, surfers and scientists alike. **Frank S. Buonaiuto** (who is all three rolled into one) captured this image when March winds and the ocean worked to produce some perfect waves along Long Island's south shore. (To watch this 12-foot wave crash onto shore, go to the Web link listed on page 15.)

Buonaiuto, who has a dual appointment at Stony Brook and Hunter College, along with colleagues **Brian A. Colle, Robert E. Wilson, Malcolm J. Bowman** and **Charles N. Flagg** at the Marine Sciences Research Center (MSRC) at Stony Brook University, will be applying a state-of-the-art wave model to the New York metropolitan region including the Atlantic Coast, Long Island Sound and Great South Bay.

The model will provide more accurate descriptions of nearshore wave fields which can be used by the National Weather Service, emergency managers for municipalities, and both recreational and commercial boaters to better forecast "severe sea-states" and erosion hazards. The wave model will also be used to improve accuracy of storm surge predictions for New York City and Long Island as well as enable lifeguard associations to anticipate days with severe rip current activity.

This project, **Modeling of Nearshore Wave Characteristics for the New York Metropolitan Region**, is one of many new research projects to be funded by New York Sea Grant in 2006.

**Sea Grant** New York

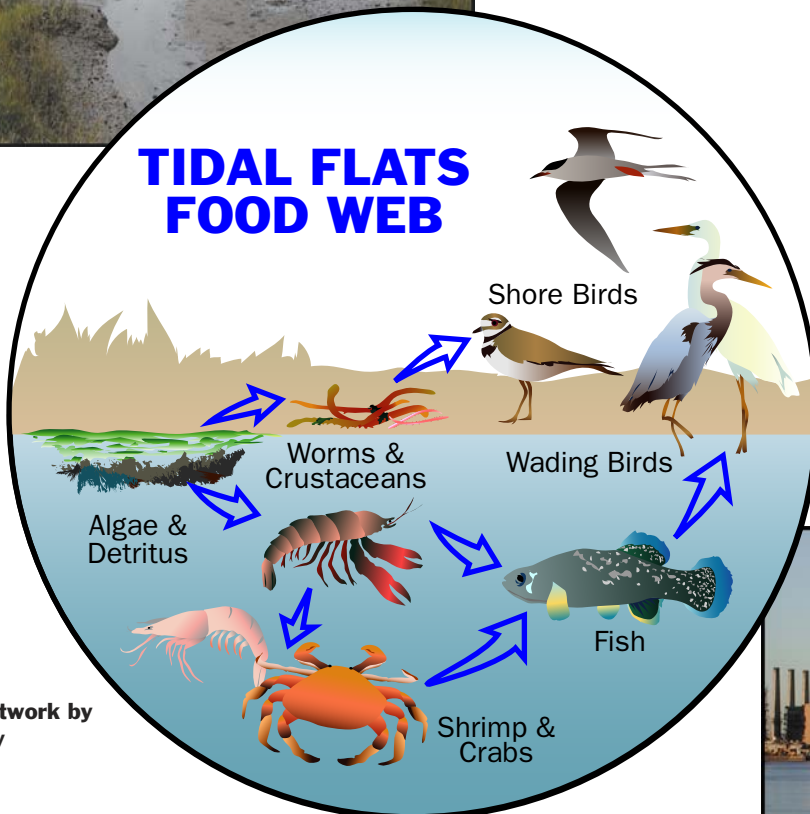NOAA — NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION — U.S. DEPARTMENT OF COMMERCE

# New Wave of Research:
## Choosing with Rigor

High standards in scientific quality and usability continue to drive the selection of NYSG's core research portfolio. Fifteen new projects began their valuable work February 2006 with more than $1 million from NYSG's budget. They are an elite group that started in a pool of nearly 60 competitive preproposals responding to topics identified in NYSG's Strategic Plan. Importance to New York was weighed by NYSG staff and its 24-member Program Advisory Council, and rigorous technical review of invited full proposals was provided by more than 90 peer experts from out-of-state universities and institutions. The 2006 projects' objectives are slated for completion in one year, but NYSG will return to allowing two-year durations in 2007-2008.



**For Wallace's project, samples will be taken from this creek on Staten Island's eastern shore.**



## TIDAL FLATS FOOD WEB

Shore Birds

Worms & Crustaceans

Wading Birds

Algae & Detritus

Fish

Shrimp & Crabs

**Food web artwork by Loriann Cody**

**Other samples will come from creeks near the busy Arthur Kill.**
**Photos courtesy of William Wallace**

> " *Each of these projects has audiences eager for the results. It's exciting and we look forward to maximizing the information flow.* "
>
> — **Cornelia Schlenk**

## The Importance of Metal Storage in Prey and Digestion in Predators to Metal Trophic Transfer in Estuarine Food Chains

The marine ecosystems of New York City's Staten Island vary from the fairly park-like creeks and tidal flats of the eastern shore to the banks of the industrial, urban Arthur Kill. In this project, **William G. Wallace** of the Biology Department and Center for Environmental Science, College of Staten Island, CUNY, will investigate how heavy metals like cadmium and mercury are transferred up the food chain. His team will examine and attempt to analyze and predict metal trophic transfer from prey organisms such as worms to higher trophic-level benthic predators such as fish. They will consider how certain prey organisms partition and store metals within their tissues and how this affects how the metal is transferred to their predators. Project results from various locations around Staten Island will help resource managers highlight toxicological consequences to predators feeding at contaminated sites and facilitate the modeling of metal body burdens in predators inhabiting impacted coastal environments.
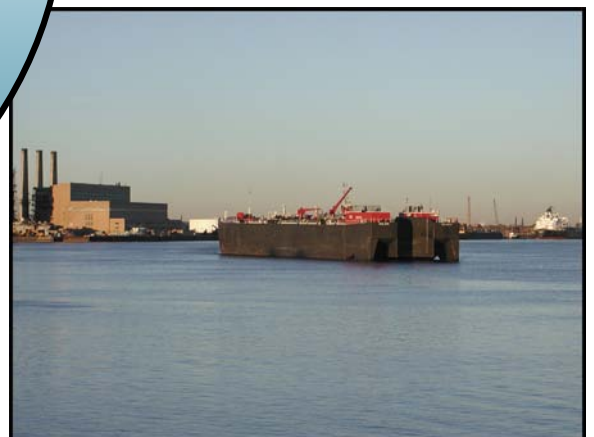
# New Wave of Research
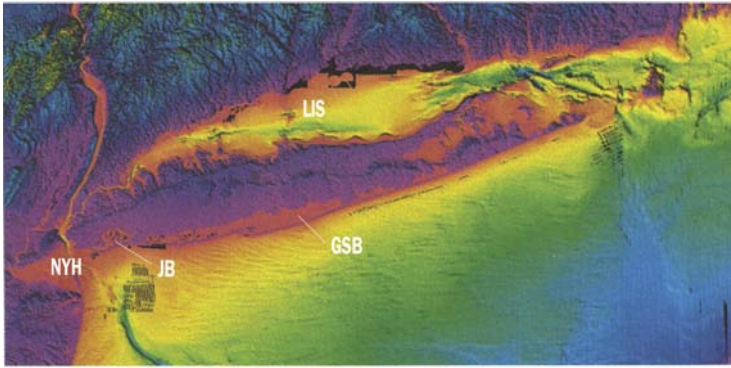


Buonaiuto's wave model project will use high resolution maps that indicate the depth of New York Harbor (NYH), Long Island Sound (LIS), and Great South Bay (GSB) by color. Cochran and Bokuniewicz will investigate submarine groundwater discharge in Jamaica Bay (JB). Map courtesy of Roger Flood

## Submarine Groundwater Discharge into Jamaica Bay, New York: Fluxes of Water and Contaminants into the Bay

**J. Kirk Cochran** and **Henry Bokuniewicz** of MSRC, Stony Brook University will investigate submarine groundwater discharge (SGD) in Jamaica Bay. With results from this project, management decisions about water quality based on budgets of nutrients and contaminants to Jamaica Bay will know whether to factor in submarine groundwater discharge as a possible significant source of these chemical species to the Bay.

## Genetic Make-up of *Fallopia* Plant Species Invading Novel Coastal Habitats

**Massimo Pigliucci** and **Christina Richards** of Stony Brook University's Department of Ecology and Evolution seek to determine the genetic make-up and degree of hybridization of the highly invasive *Fallopia* species of plants (commonly known as knotweed) on Long Island. In its native Japan, knotweed (*Fallopia japonica*) has been known to colonize the bare volcanic slopes of Mt. Fuji. But since knotweed's introduction to North America, the plant has become an invasive, overtaking native plants in salt marshes sometimes growing side by side with another familiar invader–*Phragmites*. How does knotweed survive and spread in habitats that are far more saline than its native habitat? The researchers posit that perhaps hybridization occurring between

*F. japonica* and its less invasive relative, *F. sachalinensis*, has produced plants successful in populating open beaches, salt marshes, as well as brackish and fresh water riparian areas. Project results about the genetic make up and differences of Long Island's *Fallopia* populations from European and Japanese populations along with how hybridization and selection impact the degree of invasiveness into novel habitats will help managers to predict and prevent the spread of these plants into our important coastal habitats.



Invasive *Fallopia* (left) alongside invasive *Phragmites* (right) on Long Island's south shore.          Photo by Christina Richards



Greg Boyer (r.) testing for cyanobacterial toxin. Photo courtesy of Greg Boyer

## Deployment of an Automated System for the Detection of Cyanobacteria

**Gregory Boyer** of SUNY College of Environmental Science and Forestry's (CESF) Department of Chemistry will develop an automated and instantaneous monitoring system for cyanobacterial blooms and cyanobacterial toxins in Lake Ontario. This system will be coupled with a hydrodynamic and algal growth model that will allow managers to make informed decisions about water usage, recreational contact and human exposure. National and international water resource managers will be able to assess real-time data sets to best protect against drinking water toxin contamination. The proposed optical monitoring systems can readily be incorporated into other autonomous monitoring systems located across New York State and around the country.

Bassem Allam at the Marine Pathology Lab, Stony Brook University. Photo by Paul C. Focazio

## Development and Application of a Quantitative PCR Technique to Establish QPX Dynamics in Clams and in the Environment

**Bassem Allam** and **Jackie Lynne Collier** of MSRC, Stony Brook University, will develop a quantitative real-time polymerase chain reaction (PCR) technique for research and diagnosis of the QPX organism, a pathogen that has negatively affected clam populations in New York's waters. The PCR technique will not only provide an alternate monitoring tool for QPX in hard clams, but will also open a door to investigating the abundance and dynamics of QPX in the environment which is essential for a better understanding of QPX biology and ecology. The relationship between QPX abundance in the environment and its presence and abundance in clam tissues will provide necessary information concerning QPX transmissibility and may lead to better prediction of disease outbreaks. All of these pieces of information will assist natural resource managers and aquaculturists to better manage wild and cultured clam populations in order to avoid QPX disease development and spread.

## Evaluation of Environmental and Biological Factors which Promote Toxic Cyanobacteria Blooms in New York's Great Lakes

**Christopher J. Gobler** of Stony Brook University's MSRC, will utilize molecular, ecological, and chemical techniques to understand how both environmental stressors and food web interactions may act singularly, or in unison, to promote growth and toxin production by cyanobacteria in New York's Great Lakes. As a result of this research, water and resource managers will have a baseline explanation for bloom occurrence within each major lake system. This information will help managers design a plan to minimize the impact and occurrences of cyanobacterial blooms in the Great Lakes.

## Impact of Predation by the Ctenophore *Mnemiopsis leidyi* on Larval Mortality of *Mercenaria mercenaria*

Can a squishy little critter no bigger than a grape increase the mortality of Long Island's hard clams? It can if that critter is a comb jelly that voraciously eats the larvae of one of NY's most economically-important bivalves. In this project, **Darcy Lonsdale** and **Robert Cerrato** of Stony Brook's MSRC will determine if predation by *Mnemiopsis leidyi* is a significant cause of mortality for the planktonic larvae of the hard clam, *Mercenaria mercenaria* in Long Island embayments in Great South Bay and Peconic Bay. With their results, resource managers and hard clam aquaculturists will be better able to assess shellfish recruitment in Long Island's bays and have an estimate of ctenophore prey selectivity, the rates at which ctenophores ingest bivalve larvae, and the subsequent mortality rates of bivalves.
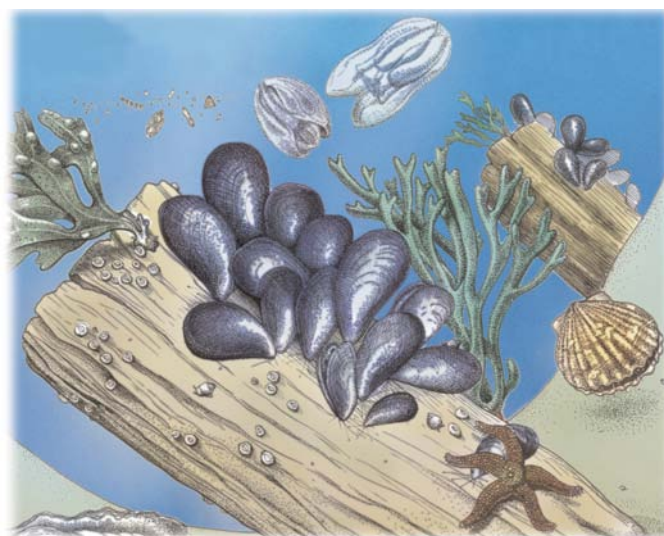


*Mnemiopsis leidyi*, shown in the top center of the illustration, is a ctenophore (Greek for "comb-bearer"), a jellyfish-like animal smaller than a grape. Also known as comb jellies, these zooplankton sport bands of undulating cilia that can act as oars to row them through the water as they consume a diet of bivalve larvae.                    **Artwork by Jan Porinchak**

## The Lake Ontario Pelagic Foodweb: A Modeling Synthesis of Salmonine Recruitment and Prey-Fish Population Dynamics

**Neil H. Ringler** and **Donald J. Stewart** of SUNY CESF along with **Robert O'Gorman** of the USGS Lake Ontario Biological Station will synthesize data from several sources that are responsible for Lake Ontario research and management and update an existing lake-wide predator/prey model. The team will also generate new data and synthesize existing information on wild production of salmonines from Lake Ontario tributaries. The project results will give fisheries scientists and managers updated information on predator/prey dynamics in Lake Ontario along with updates about wild recruitment. The resulting updated models will be useful tools for assessing the outcomes of changing climate and for managing stocking levels.
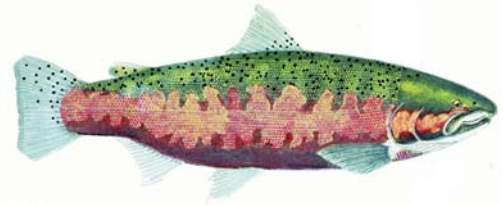
**Coho salmon in spawning phase by Peter C. Thompson**

## Effects of Changing Light Levels on Alewife-Mysid Interactions in Lake Ontario
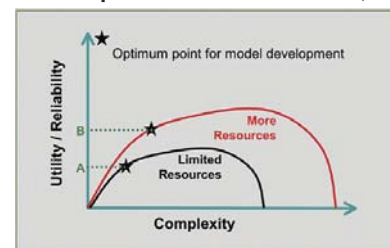
**Lars G. Rudstam**, **Edward L. Mills** and **Ellis R. Loew** of Cornell will investigate the effect of light on the interaction between an important forage fish, the alewife, and the invertebrate *Mysis relicta* through physiological measurements, laboratory experiments, and field observations. The expected outcome is to have a better understanding of alewife production in a changing Lake Ontario ecosystem. The results will provide managers with information about prey abundance to complement estimates of predatory demand.

Alewife

*Mysis relicta*
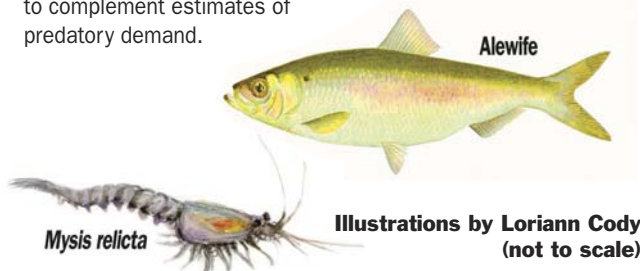
**Illustrations by Loriann Cody (not to scale)**

## The Development and Use of Predictive Models in Great Lakes Decision-Making: An Interdisciplinary Synthesis

In order to provide a synthesis of practices associated with the use of models in support of New York Great Lakes management decisions, **Jack Manno** and **Richard Smardon** of the Department of Environmental Studies at SUNY College of Environmental Studies and Forestry (CESF) team up with **Joseph V. DePinto** of Limno-Tech, Inc. and the University of Michigan in Ann Arbor. The expected outcome of their project is to improve modeling efforts and the decision-making process and interaction between the two and provide criteria to assess whether or not modeling/decision-making interaction is improving the quality of policy deliberations and Great Lakes decisions.

Optimum point for model development

More Resources

Limited Resources

Utility / Reliability

Complexity

**Graph courtesy of Joseph DePinto**

## Acoustics Unpacked:
## Analysis of the Combined Error Structure in Acoustic Surveys in the Great Lakes

**Patrick J. Sullivan** and **Lars G. Rudstam** of Cornell's Department of Natural Resources will provide a synthesis of acoustic methods of surveying fish population for all three of New York's large lakes—Erie, Ontario and Champlain—into a form that is portable and general to almost any aquatic system. The expected outcome will be a tool that integrates all the steps in deriving calculations of forage abundance and distribution in a unified way to obtain acoustic survey estimates that reflect the real precision in abundance estimates.

## The Potential of the Ribbed Mussel *Geukensia demissa* in Regulating Toxic and Small-Form Phytoplankton in Coastal Ecosystems

**Robert Cerrato** and **Darcy Lonsdale** of the Marine Sciences Research Center, Stony Brook University, will examine the potential of the ribbed mussel *Geukensia demissa* in regulating blooms of toxic algae and in regulating small-form phytoplankton that are inefficiently filtered by many other suspension-feeding bivalves such as clams. The results of this research will help provide resource managers with a new option to help improve general water quality, the quality of food for other shellfish and possibly provide a new brown tide mitigation strategy.

**Ribbed mussel *Geukensia demissa*
by Jan Porinchak**

## Dynamic Simulation of the Transport of Contaminants in the Waterways of Metropolitan New York Under Extreme Conditions

In this new project, the Stony Brook Storm Surge research team will investigate the potential consequences to water quality of the New York Harbor area if storm surge barriers were deployed to protect the Metropolitan New York region from catastrophic flooding during extreme storm events. The team members– **Malcolm J. Bowman**, **Robert E. Wilson**, **Roger D. Flood**, **Brian A. Colle**, and **Douglas Hill** of MSRC at Stony Brook University and **Frank S. Buonaiuto** of both MSRC and Hunter College—will produce a model system (Stony Brook Storm Surge Version II model) that can help evaluate the impacts on water quality from the use of storm surge barriers located at the Narrows, Perth Amboy, New Jersey and the East River.

For a refresher about an earlier project by the Stony Brook Storm Surge research team, read the Spring 2005 cover article by Lane Smith entitled "Closing the Door on Storm Surges."

# New Wave of Research

## Effect of LIS Environmental Stressors on Defense Against Disease in the American Lobster, *Homarus americanus*

With this new project, **Jan R. Factor** of the Division of Natural Science, SUNY College at Purchase, aims to determine the physiological impact of environmental stress on the immune system of the American lobster. Using *in vivo* laboratory techniques, Factor will measure the impacts of sublethal exposure to the environmental stresses of high temperature and reduced oxygen on *Homarus americanus*. Results from the project are expected to provide information for managers, agencies, and the public that will help explain the physiological basis for the Long Island Sound lobster mortalities by determining the mechanism of impact on the immune system. The research will also provide additional evidence and insight about the role of natural environmental stress and climate change on the health of LIS lobsters and the long-term prospects for the LIS lobster fishery.

*Barbara A. Branca, Patrick Dooley, Cornelia Schlenk and Lane Smith contributed to this multi-page article on new research.*