THALLIUM

Emerging Pathways

COASTLINES

Mercury thermometers. Cadmium batteries. Lead shields. These metals are helpful in any number of technological devices. But thallium may be a new one to you. Nestled between mercury (Hg) and lead (Pb) among the p-block elements of the periodic table, thallium (Tl) is also a heavy metal with industrial uses. Discovered in 1861, thallium is more toxic to mammals than mercury, cadmium or lead.

Decades ago, thallium was commonly used in ant, rat and roach poisons. Currently, there is an increasing demand for thallium for use in the laser, optical, and other high-tech industries. Although not used to the extent it was in the past, thallium is still found in New York's Great Lakes region.

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From the Director

The "pathways" theme of the cover article on the heavy metal, thallium, is echoed throughout this issue of *Coastlines*. As you'll read, thallium pathways involve deposition of particulates on the water, transformation into several different chemical forms in the water, uptake by microscopic plants, transfer to animals that eat the plants, and so on up the food chain. Such information is critical for determining the potential impacts of this contaminant in the Great Lakes.

Pathways from land to water are the focus of NEMO (page 8), the educational program that helps municipal officials develop plans to prevent non-point source pollution from being transported into aquatic environments. NYSG NEMO specialists help officials make decisions to reduce the impacts of stormwater runoff on water quality.

Evaluating the potential for using storm surge barriers to avoid flooding in New York's metropolitan area is the subject of NYSG-sponsored work that was described at "Earthstock 2005" (page 12). The barriers, still in the theoretical stage, have not been built, but their effects were simulated with the use of storm surge models. They offer one option for avoiding catastrophic flooding—by obstructing the pathways for surging seawater.

On a slightly different note, we could say that each of the other articles in this issue–on brown tide research (page 6), students on the move (page 10), and dune stewardship (page 13) all document the different pathways that NYSG uses to get information into the hands of people interested in preserving or enhancing our coastal resources.

Even the *Coastlines* survey was a pathway to improve the newsletter.

Speaking of evaluation pathways as a mechanism for improvement, New York Sea Grant is having its five-year review at the end of September. I should be preparing, so I think I'll close here and get on with it!

Hope your summer has been a good one.

***Aureococcus anophagefferens* is the alga responsible for the brown tinge in the water sample displayed by Christopher Gobler, a researcher at Stony Brook University's Marine Sciences Research Center. The alga is considered to be at "bloom abundances" when its cell count is greater than 500,000 cells per milliliter. (See article page 6)**
Photo by Robert Anderson

On the Right Path with Coastlines

Thanks, *Coastlines* readers, for the overwhelmingly positive responses to the survey conducted by the School of Informatics at the University at Buffalo regarding the content and format of our newsletter. In late 2004, over 900 of our 6000 + subscribers were sent a 45-question survey. Of the nearly 20% who returned completed surveys, almost all agreed to a follow up telephone or email questionnaire. Here's what we found out.

Coastlines readers are highly engaged

- More than three-fourths of the respondents regularly read *Coastlines*. A high pass-along readership coupled with a high retention of past issues points to the enduring content quality and broad content appeal among readers.
- Most readers (85%) are very satisfied with the quality of editorial content and find the information in *Coastlines* very interesting and useful. More than a third report that the information has influenced their attitudes; most respondents also agree that the newsmagazine keeps them informed about coastal issues and events.
- Close to three-fourths of the respondents find *Coastlines* well laid out and easy to read. Three-fourths find the art work appealing and more than 80% find the graphics and photographs appropriate.
- Close to three-fourths of the respondents find the issue length appropriate, while a majority finds the timing of each issue appropriate.
- A segment of respondents would like to see improved editing and formatting. This is certainly one of our goals. Although a majority of the respondents find the length of *Coastlines* articles appropriate, some call for shorter articles while others seek more detailed and in-depth articles. However, most respondents (85%) show overall satisfaction with *Coastlines*.

Who reads Coastlines?

- Most *Coastlines* readers are well educated, mature, and receive their issues through conferences, their association with Sea Grant personnel, or at their place of work.
- While more than two-thirds (68%) of *Coastlines* readers are males, this is down from the overwhelmingly (80%) male readership found in a 1996 survey.
- When we asked readers to categorize themselves, more than a quarter (27%) of all respondents were educators or students, 22% were concerned citizens and/or property owners; 18% were coastal business owners or associations; 17% were in government (a majority of whom were affiliated with a federal, state, or local agency), 13% were recreational anglers, boaters, or divers; 11% were from environmental organizations; 7% were researchers; and 5% were affiliated with the media.
- A majority of *Coastlines* readers are informed, active readers and information seekers who read a newspaper every day and a magazine addressing coastal issues at least once every week. They are also computer savvy, and the majority spend at least an hour a day online. However, although *Coastlines* readers use the Web, the overwhelming majority of readers prefer to receive a copy rather than read it on the Web.

We hope to continually improve our publication with your help.

Congratulations to our winners and thanks to all our *Coastlines* readers.

— Barbara A. Branca

And the Winners Are...

In a random drawing conducted by the School of Informatics at the University at Buffalo, each of these lucky survey respondents won a $100 gift certificate to a sports outfitter:

Eileen Baker, Setauket

Dennis Kanyuk, South Hempstead

David Siegfried, Brockport

Karen Vetere, Kingston

Ann Zulkosky, East Setauket

continued from page 1

Emerging Pathways

Thallium enters the atmosphere through the combustion of coal, smelting of other metals, or other industrial processes. Once in the air, thallium particles can be deposited onto the lakes where they dissolve in water. Soluble thallium enters the food web through uptake by tiny plankton. They in turn are eaten by zooplankton which are eaten by inverterbrates and so thallium biomagnifies up the food chain.

Soluble thallium can be taken up by phytoplankton, then zooplankton, and so on up the food chain.

Artwork by Jan Porinchak

In the early 1970s, bald eagles and other wildlife populations around the Great Lakes basin displayed symptoms of thallium poisoning. For wildlife and people, signs of thallium poisoning include vomiting, hair-loss, neurologic and psychotic symptoms, liver and kidney damage.

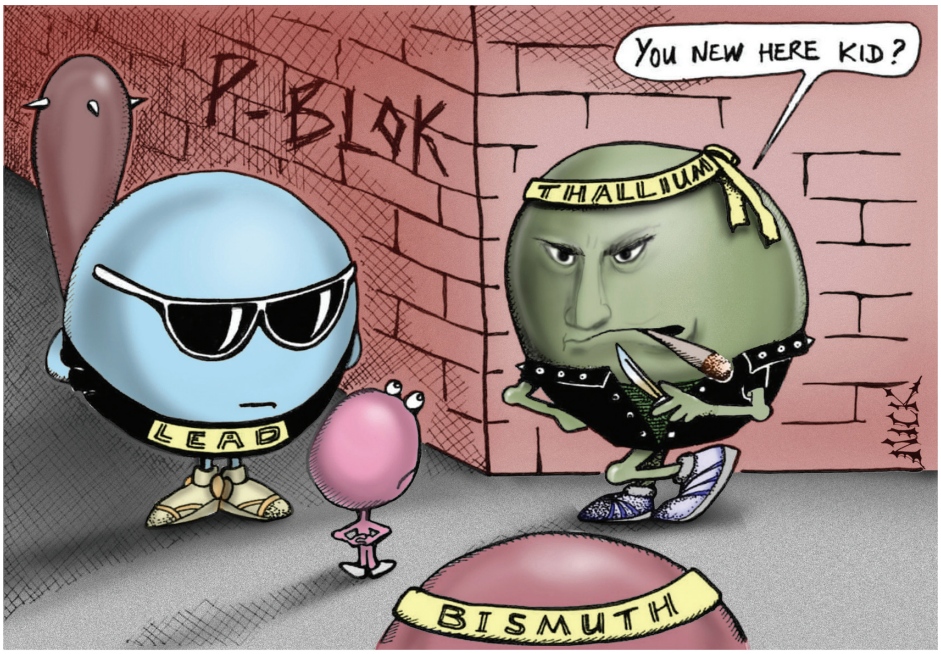
With little known about thallium uptake in lake food chains, researchers **Nicholas S. Fisher** from the Marine Sciences Research Center, Stony Brook University, and **Michael R.Twiss** of the Department of Biology, Clarkson University, set out to clarify these pathways. Their NYSG-funded project was to determine the degree of bioaccumulation of thallium in the freshwater microbial food web, focusing on key species of phytoplankton and zooplankton in Lakes Erie and Ontario.

Thallium in the Great Lakes

Previous research had shown that once thallium enters a lake, it can readily assume any of several different oxidation states depending on the environmental conditions. Thallium uptake by aquatic organisms may differ between the different oxidation states of the element. One oxidation state of thallium derived from coal ash, Tl^{+}, is thermodynamically stable and only weakly reacts with other inorganic or organic compounds. This form of thallium is accumulated intracellularly by aquatic organisms via the potassium ion channels in cell membranes and reactions with sulfur-containing proteins. Once in the cells, Tl^{+} is slow to leave, making it a very toxic form of thallium. Another oxidation state is an inorganic colloidal form, Tl^{3+}. This form is highly reactive and may accumulate on cell surfaces, but not to the extent of the more toxic Tl^{+}.

Over the last several decades, it had been reported that high levels of thallium accumulated in lake trout, a major sport fishery in Lakes Ontario and Erie. In 1987 to address this concern, New York State established an ambient water quality standard in order to protect fish, although there was no toxicity data to support this limit. Then in 1995, a Canadian study documented that dissolved thallium was on the increase across the Great Lakes; Lake Ontario had an average of 5.8 ng/L (nanograms per liter) of dissolved thallium and Lake Erie had 9.1 ng/L. Since that report there has been no ambient water quality standard established for thallium across the Great Lakes. Although the absolute amounts of thallium used in industry are relatively low, increasing use of thallium in high-tech manufacturing and the continued use of coal for energy will inevitably lead to its unavoidable dispersal and increased mobilization in the environment.

Utilizing state-of-the-art trace metal clean protocols and radioisotope methodologies, Fisher and Twiss assessed how thallium is transferred in plankton in the Great Lakes. The team collected phytoplankton and zooplankton from Lakes Ontario and Erie for bioaccumulation experiments both onboard research vessels and in university labs where thallium uptake and depuration rates



Unwittingly, and against his mother's advice, Vince the first-row transition metal had been lured far away from home, and now found himself surrounded by heavier elements of the P-block.

Original cartoon by Nick Kim, an environmental chemist from Hamilton, New Zealand with a great sense of humor and a serious interest in how thallium gets in the food chain.

within the lower food web were examined. The researchers looked at how resident plankton, including single-celled plants (phytoplankton), animals (protozoa), and bacteria, control the transformation of thallium into its various forms. They also examined the mechanisms by which phytoplankton take up and accumulate dissolved thallium. Since phytoplankton form the base of the aquatic food chain, they are an important entry point for toxic substances into the food web. The research also set out to determine the relative toxicity of Tl^{+} and Tl^{3+} to phytoplankton.

Thallium Pathways and Potential Impacts

Fisher and Twiss found that once thallium enters lake waters, it is converted into several different forms, including the two types described above (Tl^{+} and Tl^{3+}), as well as an organic form, dimethylthallium or DMT. Organic thallium, DMT, is also actively accumulated by phytoplankton, but apparently not by the same mechanism as Tl^{+} which is through potassium ion channels. The team found that aquatic bacteria are able to convert Tl^{+}, the form of thallium introduced by coal ash, to Tl^{3+}, the less toxic form of thallium. They also found that although Tl^{3+} is less toxic than Tl^{+}, Tl^{3+} has a much higher bioavailability than the more toxic Tl^{+}.

However, there was no consistent trend with respect to thallium uptake by different size classes of plankton. Once associated with phytoplankton, thallium can be assimilated with an efficiency of 40-50% from different phytoplankton species and by cladocerans, an important component of the zooplankton community. This relatively high assimilation can explain its passage up the food chain, leading to fish and other trophic levels in the Great Lakes ecosystems.

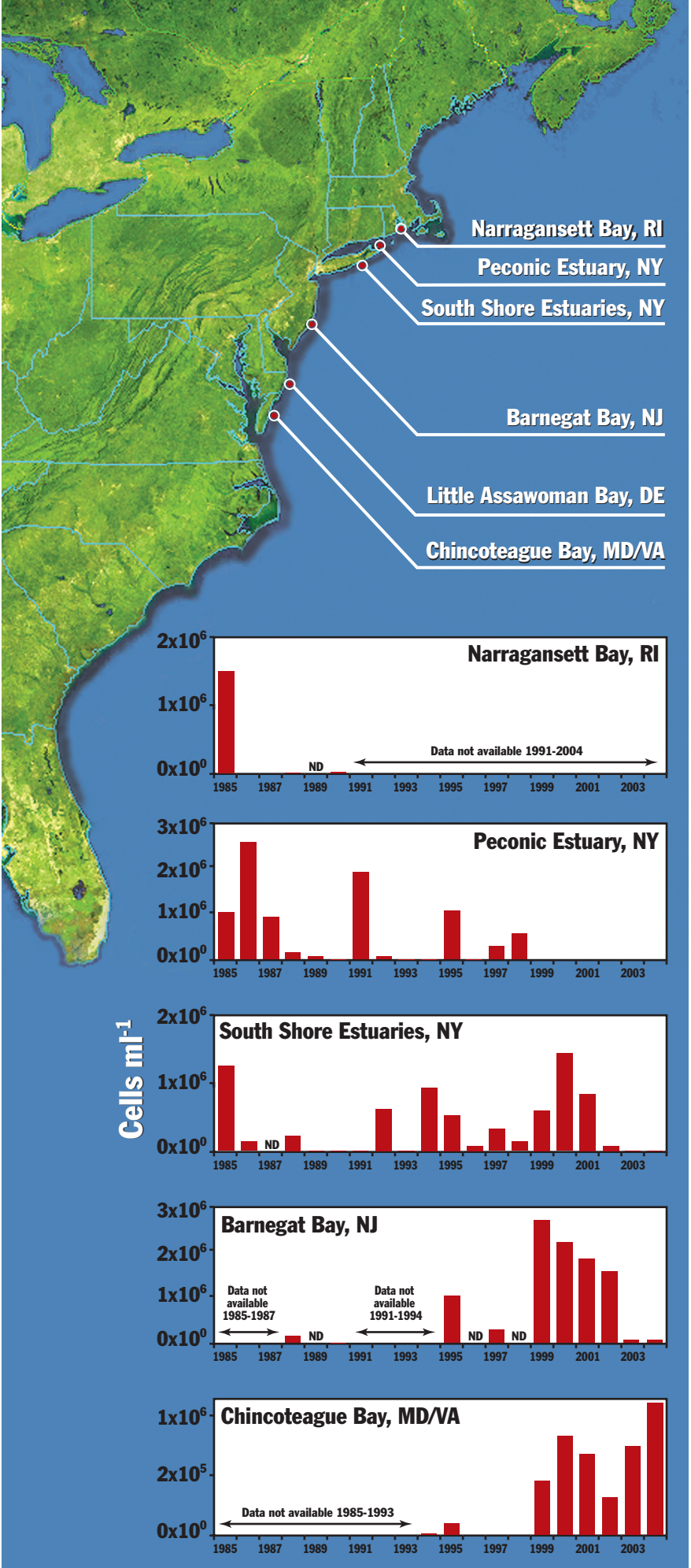
Considering these results, thallium is emerging as a pollutant of potential concern in the Great Lakes. Although it is not yet a prevalent problem in the lakes, these results suggest that industry be circumspect in its use of coal and consider rapid implementation of clean coal technologies. Since thallium oxidation states differ in their toxicity and bioavailability, this information will allow managers to more intelligently predict the ecological effects of dissolved thallium in lakes.

— Barbara A. Branca and Patrick Dooley

See page 15 for a bibliographic list of journal reprints related to this project.

Brown Tide:

The Final Chapter



Twenty years ago, blooms of *Aureococcus anophagefferens* suddenly appeared in Long Island's Peconic Bay, Rhode Island's Narragansett Bay and possibly in New Jersey's Barnegat Bay. Blooms of this microscopic alga caused the waters to turn coffee brown, prompting the name "brown tide."

Since 1985, Long Island's south shore bays and other Atlantic coast estuaries have experienced intermittent brown tides. *A. anophagefferens* cells have been showing a geographic expansion with cells positively identified, at least at low levels, in the phytoplankton community from Maine to Florida and on the continental shelf off the northwest Atlantic Ocean (as illustrated by the brown shading along the eastern US seaboard in the map at left). They have even appeared across the Atlantic in Saldanha Bay, South Africa, where they bloomed between 1997 and 1999. Bays in New Jersey, Maryland, Delaware, and Virginia have also experienced brown tide blooms as shown in map and graphs at left.

BTRI: A Need Arises

Recognizing Sea Grant's broad capabilities for designing and coordinating research programs with links among academia, agencies and others on the federal, state and local levels, NOAA's Coastal Ocean Program (COP) collaborated with NYSG in 1996 to develop the Brown Tide Research Initiative (BTRI). BTRI became a 6-year, $3 million dollar program of coordinated research and outreach involving as many as 19 investigators and 12 institutions and agencies.

"The success of BTRI is, in large part, a result of the leadership and expertise of NYSG," says **Susan Banahan**, COP's Program Manager. "NYSG facilitated information exchange among investigators and assumed a major role in the synthesis of results. In addition, Sea Grant's BTRI outreach program paralleled the research efforts. The BTRI newsletter series, Web site, investigator workshops, and public symposia have provided a unique opportunity for the public to stay informed on research progress and communicate directly with BTRI scientists."

Under greatest magnification is an *Aureococcus anophagefferens* cell with a distinct cell wall. The photomicrograph shows a phytoplankton assemblage that includes the circular brown tide cells and elongated diatoms. For comparison's sake, 50 brown tide cells can fit across the width of an average human hair. Placed side-by-side, it would take about 2,500 hairs to cover an inch.
Photo composite by Anita Kusick
Photos by Robert Nuzzi and Robert Anderson

The overall objective of the Brown Tide Research Initiative was to determine the physical, chemical and biological factors that cause, sustain, and lead to the cessation of *Aureococcus* blooms. "Brown tide has been a significant and difficult puzzle," says NYSG's Assistant Director **Cornelia Schlenk**, "but steady progress has been made in past years toward understanding what makes it tick."

Cumulative BTRI results have advanced new research directions and influenced state and local policy by narrowing the field of likely causal factors. The inclusion of brown tide research in the comprehensive management plans for both the Peconic Estuary Program and the South Shore Estuary Reserve demonstrates BTRI's influence on state and local policy. Members of BTRI's ad hoc Steering Committee have provided valuable insight to NOAA's Coastal Ocean Program. BTRI's research priorities were incorporated into the Ecology and Oceanography of Harmful Algal Blooms (ECOHAB), a larger national program of harmful algal bloom research that continues to support brown tide studies.

"Consultation with BTRI's Steering Committee was key to helping NYSG and the COP determine the priorities for research and prepare outreach communications," says Banahan. "In addition to a much improved understanding of brown tide blooms, BTRI produced a 'next generation' of brown tide investigators critical to the further advancement of this line of research."

Effects of Brown Tide

Even though brown tide has no known impacts on human health, *A. anophagefferens* has negatively affected Long Island ecosystems, shellfisheries and economies. Sunlight can be blocked by the dense biomass of cells during an intense brown tide bloom, shading parts of the water column negatively impacting eel grass (*Zostera marina*). Eelgrass beds serve as a vital nursery for finfish and shellfish and a refuge for many other estuarine organisms.

The hardest hit shellfishery has been the bay scallops (*Argopecten irradians*) in Peconic and Gardiners Bays, with an estimated monetary loss of $3.3 million annually. This fishery has been unable to recover from the extensive recruitment failure after the loss of the 1985 bay scallop year-class. Other shellfish, including hard clams (*Mercenaria mercenaria*), have also been affected.

Recent field results show that juvenile hard clam growth was significantly lower during a brown tide in Maryland with cell abundances of 100,000 cells per milliliter (a milliliter is equivalent to about 7 to 8 drops of water). At these bloom abundances, most juvenile hard clams die. Those able to survive recover and resume growth after the bloom ends. *A. anophagefferens* also has a negative impact on the growth and egg production of zooplankton, a major food source for some fish. Some zooplankton can consume *A. anophagefferens*, though at lower rates compared to other phytoplankton in the community.

That's a Wrap

To help wrap-up the BTRI effort, three investigators–Stony Brook University's **Darcy Lonsdale** and **Christopher Gobler** and SUNY College of Environmental Science and Forestry's **Gregory Boyer**–recently completed a document that brings together and synthesizes results from BTRI and other brown tide research projects. This synthesis will be published in the scientific journal *Estuaries* by year's end.

"We strove to make the manuscript as comprehensive as possible by incorporating and synthesizing results from over 150 different peer reviewed articles," says Gobler. "We also wanted to be sure to include the perspectives of multiple BTRI investigators and other scientists. Toward that end, the paper was reviewed by eight scientists and the BTRI Steering Committee's seven members."

continued on page 12

Coast

The Next 'Phase'

Contaminated stormwater, a key concern in Long Island's estuaries, can result in restricted bathing, reduced fishing, poor surface water quality and degraded wetlands and wildlife habitats. Storm drains in parking lots and streets can convey contaminants such as sediment, debris, fertilizers, oil, gas and pesticides to water bodies. NYSG NEMO specialists are assisting Long Island's elected and appointed officials in complying with the EPA Phase II stormwater regulations to address these issues. Photo by Anita Kusick

With a shoreline of over 1,000 miles and a wide range of natural and recreational resources, Long Island's coastal environment is integral to its residents' quality of life. Its two counties, Suffolk and Nassau, topped 2.8 million inhabitants in 2000, a figure greater than that of 19 States. Nearly completely developed to the west, Long Island faces mounting water quality concerns and, on its east end, strenuous development pressure.

"Long Island's three estuary management programs – the Long Island Sound Study, the South Shore Estuary Reserve Council and the Peconic Estuary Program – have identified the pollutants carried by stormwater as a primary cause of the declines seen in the Island's coastal resources," says **Eileen Keenan**, New York Sea Grant's Nonpoint Education for Municipal Officials (NYSG NEMO) Program Manager. "These conditions are impacting the quality of life Long Islanders have traditionally enjoyed." NEMO specialists like Keenan in nearly 32 states across the U.S. have been educating local officials about linkages between land use and water quality issues for close to 15 years. Why? Because local elected and appointed officials, such as trustees and planning and zoning board members, make important land-use decisions that determine the social, economic, and environmental health of their communities. Further, given that contaminated stormwater flows across jurisdictional boundaries, local land use decisions can often result in regional impacts.

Out off the east end of Suffolk County, the Peconic Bay's blue waters are rich in natural resources. The Osprey, perched atop a Shelter Island dock post (above), is symbolic of resource protection advancements in the Northeast. NYSG NEMO specialists are extending their program in Suffolk County to support continuing water quality protection and restoration.

NYSG's NEMO Program began in May 2000, with Keenan assisting the watershed protection committees for Hempstead Harbor and Manhasset Bay in reducing the impacts of polluted runoff along western Long Island's urbanized north shore. Keenan now oversees two additional water quality specialists, **Christy Witters** and **Steve Mikulencak** (see sidebar, page 9), and says of the program, "We're expanding its reach throughout Long Island in support of consistent, effective approaches to natural resource protection."

According to Witters, NEMO's lead educator for the South Shore Estuary Reserve, "This program is uniquely situated to provide education on innovative land use practices to protect water quality while assisting municipalities with the new EPA Stormwater Phase II requirements." Effective in 2003, the U.S. Environmental Protection Agency's municipal Phase II regulations require Long Island municipalities to develop and fully implement stormwater management programs by 2008.

Within the Island's two counties are two cities, 13 towns, and 95 incorporated villages. So, NYSG NEMO's stormwater management recommendations emphasize intermunicipal approaches to ensure cost-effective, optimal resource protection. "Through our workshops, consultations, and role as a liaison, we have supported advancement of regional approaches to alleviating stormwater issues on Long Island," says Keenan.

NYSG's NEMO specialists assist Long Island officials in building on their natural resource protection efforts while achieving Phase II regulatory compliance. "The EPA Phase II regulations present an impetus to expand on existing efforts, to strengthen ties between Long Island's estuary programs and local governments and to implement proactive approaches that will also ensure the future vitality of Long Island's very special communities," says Keenan.

Watch

Nassau County has taken the lead in forming a storm-water coalition of over 50 municipalities. "The County's Stormwater Management Program is an example of smart government at work," says Nassau County Executive **Thomas R. Suozzi**. "This program has helped to reduce the duplication of services and costs while providing more comprehensive services."

NYSG NEMO has provided support to Nassau County officials on illicit discharge detection and elimination, municipal pollution prevention and Phase II program evaluation and reporting guidelines. "NEMO has been a tremendous asset to the Nassau County Department of Public Works (DPW) through their assistance with the implementation of a public education program to both residents and municipalities on how to best protect our coastal resources in Nassau County," says DPW Sanitary Engineer **Ken Arnold**. "In addition to this outreach, NEMO has also been a strong supporter of the County's efforts to launch the Adopt-A-Waterway Campaign to help remediate the impacts that storm water runoff has on local bodies of water."

Municipalities in Suffolk County are now engaged in intermunicipal management strategies as well. For example, the Town of Southampton formed a Phase II stormwater management partnership with its five villages. Elsewhere in Suffolk, joint runoff control efforts are underway in the Town of Huntington and in the Nissequogue River drainage basin.

In May, Suffolk County Executive **Steve Levy** unveiled $4.5 million in stormwater remediation projects that were approved by the County Legislature. "The County's stormwater runoff remediation program will utilize natural filtration systems along with specially landscaped

drainage swales and basins that rely on biological processes to remove oil, silt and sediments from road runoff before being discharged into waterways," says Levy, in a May 2005 press advisory. "Stormwater is a major concern on Long Island, as evidenced by this recent Suffolk County initiative," adds Keenan.

"Long Island municipalities continue to make major strides with respect to resource protection," says Keenan. "They have provided pollution prevention services, policies and projects for many years." "However, she cautions, "the cumulative affects of increased development and population now require improvements in efforts to protect and restore Long Island's fisheries, beaches, bays and harbors. Proactive, preventive measures are key," she says.

"Stronger connections are needed between jurisdictions in order to ensure the effectiveness of municipal resource protection measures. More community members and local decision makers need to recognize that, to protect coastal resources, land use practices need to be modified. And this is not limited to waterfront properties. Stormwater transports contaminants across distances, particularly when it flows through constructed conveyance systems."

— Paul C. Focazio

EPA's Phase II stormwater regulations address construction activity and land development in order to minimize the ongoing impacts that alterations to the landscape can cause. NYSG NEMO specialists support local governments in their oversight role. Photos courtesy of Eileen Keenan and NYSG's NEMO Program

Look who's new...

This past February, Water Quality Educator Christy Witters joined the NYSG NEMO program. Witters is assisting Long Island municipalities within the South Shore Estuary's drainage area.

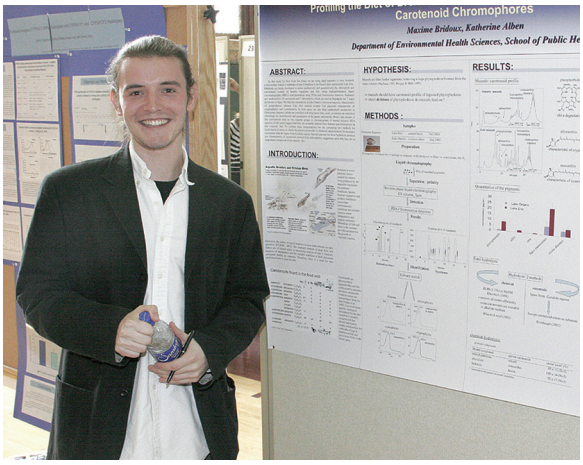
"Through presentations and workshops, we will help local governments to amend their land use and sediment and erosion control ordinances to reflect innovative Best Management Practices to reduce contaminated stormwater runoff," says Witters. "One of my goals is to foster inter-municipal coordination and promote a watershed approach to stormwater management." A watershed is the entire area of land that drains into a single stream or body of water (see "Reaching a Watershed", Fall '99 *Coastlines*).

Steve Mikulencak began work as the program's second water quality educator in late March. His goals will parallel Witters', with a primary focus within the Peconic Estuary drainage area. "With our target audience being local land use decision makers," Mikulencak says, "our challenge is to take the complexities of land-use planning, ecology, and environmental regulation and translate that into practical, succinct, understandable language for planners, public works personnel and town trustees."

Both Witters and Mikulencak (pictured above with Keenan, in middle) are producing fact sheets to help local officials establish procedures for stormwater management. Says Mikulencak, "We're not only informing decision-makers about non-point source (NPS) water pollution, but also about strengthening their own critical role in protecting Long Island's water quality."

NPS occurs when rainfall, snowmelt, or irrigation flows over land or through the ground, picks up pollutants, and delivers them into rivers, lakes, coastal waters, or ground water. "If we can convince local decision-makers that reduction of non-point sources of water pollution is solidly linked to sound planning, community character, and close working relationships across political boundaries, then we've made progress," says Mikulencak.

For all things NEMO-related, log-on to: www.nyseagrant.org/nemo.



Sea Grant Scholar Maxime Bridoux beams in front of his award-winning poster.

Photo courtesy of Maxime Bridoux

A Is For Aquatic:

New York Sea Grant Scholars, Fellows and Students on the Move

At the State Capital

With a bachelor's degree in biochemistry from the University of Lille in his native France, **Maxime Bridoux** set out to pursue a lifelong interest in aquatic sciences. As a graduate student with a strong focus in limnological sciences at the University of Geneva, Switzerland, field trips took him to the Adriatic Sea in Italy and the Danube River in Romania. He also did his master's research internship in the limnological laboratory of **Dr. Michael Twiss** at Clarkson University (see page 4) on the limitation and toxicity of trace metals in phytoplankton. This led Maxime to pursue a doctorate at the University at Albany's Department of Environmental Health and Toxicology. There he is a New York Sea Grant Scholar working with **Dr. Katherine Alben** on the use of carotenoids as biomarkers of the food web. Dr. Alben has been addressing the problem of type E botulism in New York's Great Lakes.

Adam Chesin, this year's REU student, studies sediment samples from the bay. Photo by Sarah Holsinger

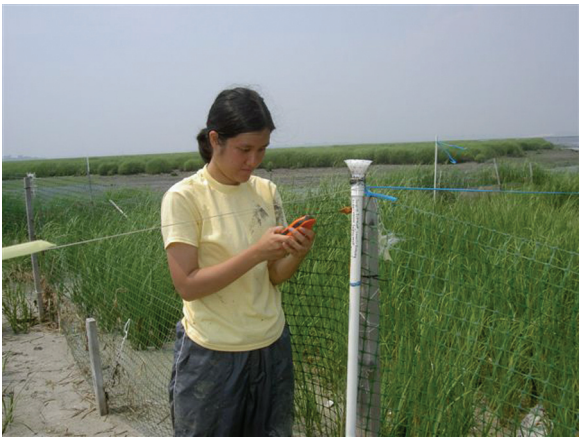
Says Maxime, "Carotenoids are chemo-taxonomic pigments of phytoplankton and they are bioaccumulated by aquatic organisms (and animals in general) only from their diet. We determine the carotenoid composition of tissues from benthic invertebrates and fish to deduce their food-web relationships. From this information, it is of interest to identify trophic pathways for outbreaks of type E botulism in fish and fish-eating birds of the Great Lakes." His poster detailing these pathways won first place for the Department of Environmental Health and Toxicology in this spring's poster contest held annually in Albany.

Along the Hudson

Sanpisa Sritrairat is very excited about her new position as NYSG's Hudson River National Estuary Research Reserve (HRNERR) Fellow. Originally from southern Thailand, Sanpisa has

Sanpisa Sritrairat and Miriam Jones, another student of Dr. Dorothy Peteet of Columbia, prepare to take water samples.

Photo by S. Cecelia Baum



(Left) HRNERR Fellow Sanpisa Sritrairat locates her position along Piermont Marsh using GPS after setting an atmospheric trap (the white funnel atop a PVC pipe) to capture pollen. Traps along a N-S transect of the Hudson basin will provide data for understanding ecological changes and the spread of invasive species such as *Phragmites*.

Photo by S. Cecelia Baum

Photo by Sarah Kolbe

been intrigued by wetlands since her youth. As an undergraduate at Rensselaer Polytechnic Institute (RPI) in Troy, NY, she received a Howard Hughes scholarship to do molecular biology research on symbionts of the aquatic fern, *Azolla*. She worked in the freshwater lab at RPI directed by **Dr. Sandra Nierzwicki-Bauer** (a former NYSG Scholar and zebra mussel researcher) and studied biogeochemical cycles and methane production in wetlands on the Chesapeake Bay and Patuxent River in Maryland with **Dr. Patrick Megonigal** at the Smithsonian Environmental Research Center. As a college senior, she analyzed carbon transport in the Delaware River Basin and Hudson River sediment transport supervised by **Dr. Richard Bopp** (who authored NYSG-funded Hudson River contaminant report).

Sanpisa received her Bachelor's in Environmental Science, Biology, and Hydrogeology from RPI in 2004. "The Hudson River has served as a big classroom and laboratory for the courses I took at RPI," she says. "As a graduate student at Lamont Doherty Earth Observatory of Columbia University and with this NYSG/ HRNERR fellowship, I have a chance to continue my interest in the river."

Sanpisa will examine ecosystem changes from anthropogenic and climatic factors with Columbia paleobotanist **Dr. Dorothy Peteet** using pollens and macrofossils. Hudson River marshes are a great "natural trap" for microfossils. Examining the fossil record will improve understanding of vegetation and climate changes over the past thousands of years and teach us about the "undisturbed" ecology of the Hudson and how human activity and land use changes have affected it. From this research, Sanpisa also hopes to learn more about how exotic and invasive species spread along the Hudson. The project will also contribute to other research fields such as contaminants transport, contaminant dredging, sediment transport, water quality, and toxicology.

On the "Doc" of the Bay

Adam Chasin, this year's NYSG-funded REU student (Research Experience for Undergraduates) at Stony Brook University, finds himself knee deep in Great South Bay this summer. For his REU project, Adam worked with **Dr. J. Kirk Cochran** and **Dr. David J. Hirschberg** from the Marine Sciences Research Center on the application of radionuclides as geochemical tracers in sediments of Great South Bay. "The radionuclides serve as good indicators as to whether the sediment is accumulating or dispersing on the ocean floor," says Adam. His project tries to account for the varying concentrations of these radionuclides in the sediment and find a correlation between a specific type and concentration with individual species. "The relationship between the species and the radionuclide samples shows whether the sediment levels are getting higher or lower due to species interactions," says Adam.

In the fall, Adam will return to the University of Binghamton as a senior with an eye on a BS in biology come graduation. Afterwards, he has ambitions of attending medical school and becoming a doctor.

— Barbara A. Branca

Two Years Running

This summer, Sarah Holsinger, (above) who will be a senior in geological sciences at Northwestern University, worked primarily with Steve Goodbred on interpreting seismic data and using core sampling to establish the sediment history of Great South Bay. In 2004, she was the NYSG-funded REU student under MSRC's Roger Flood learning about the geologic evolution of Great South Bay using seismic sub-bottom profile data. After graduation, Sarah plans to study marine geology in graduate school.

Grad student Phil LoCicero (l.), REU student Sarah Holsinger and Dr. Robert Cerrato go core sampling on Great South Bay.
Photo by Kim Rogers

Taking Stock of...
Storm Barrier Research

"Storm buster" Dr. Malcolm Bowman, Chair of the EarthStock 2005 organizing committee (kneeling), with NYSG's Susan Hamill and Paul Focazio at EarthStock 2005. Photo by George Carroll

"Respect for nature" is an Earth Day credo worth heeding. But containing nature–that is something else. Stony Brook Storm Surge Research Group collaborators **Malcolm Bowman**, **Frank Buonaiuto**, **Brian Colle**, **Roger Flood**, **Douglas Hill** and **Robert Wilson** and their marine science students are suggesting just that. The group's NYSG-funded project used storm surge models to determine the feasibility of using barriers positioned at strategic "choke" points around metropolitan NY to ward off nature's wrath and prevent storm surge flooding (see Spring '05 *Coastlines*). The combination of high tides and a storm surge during an intense storm would be devastating, given the vulnerability of lower Manhattan tenuously situated at just 10 feet above sea level. Storm barriers could effectively prevent potentially catastrophic flooding and loss of property and life in the event of a 100-year storm. "What gives urgency to the project is the acceleration of sea level rise associated with global climate change," says Bowman.

NYSG got the word out about this project on a brisk, bright, wind-swept day in April at EarthStock 2005, when it was among the 55 organizations and sponsors demonstrating ways to ensure a safe, healthy environment for the future. Over 3,500 attended the free open-air festivities hosted by Stony Brook University.

NYSG's colorful display included photos of what some downtown landmarks might look like under flood conditions. "Goddard Institute of Space Studies scientists in Manhattan predict up to a two-foot sea level rise by 2050. Thus a modest 5-year storm event in 2050 will do as much damage as a rare 100-year storm event would do today," says Bowman. The images brought many curious visitors to the booth, generating interest in the potential use of protective barriers as a way to counter storm surge destruction in our vital city.

"Celebrate, respect and protect mother Earth and her environment." That was the challenge and the theme that swelled in the hearts of all who enjoyed Earth Day at this year's EarthStock 2005. But protecting and maintaining a habitable environment for the future may take some cooperation with the forces of nature.

— Susan Hamill

Brown Tide: *The Final Chapter*

continued from page 7

A laymen's version of the to-be-published *Estuaries* article will constitute the ninth and final issue of BTRI's report series, scheduled for publication by this October. Synthesis information will also be presented at the final informational public symposium, to be held later this fall. "We look forward to sharing the synthesis of the research results in a format that will be easily understandable for all," says Schlenk.

"All the BTRI investigators worked very well together to help put all the brown tide pieces in place," adds Patrick Dooley, NYSG's BTRI Outreach Specialist. "Our better understanding of brown tide is due to their insightful research and dedication. BTRI is a successful example of a coordinated research and outreach effort that can serve as a model to approach other environmental issues."

Adds Gobler, "While I believe we accomplished what we set out to do, brown tide research continues today, so the story is not truly over. Perhaps another synthesis paper will be needed in another 20 years."

For more information on brown tide and the future public symposium, visit the BTRI web site: **www.nyseagrant.org/BTRI**.

— Patrick Dooley and Paul C. Focazio

Packets Prompt Citizens to Save Dunes

NYSG Stewardship Educator Molly Thompson (r.) presents Sandy Pond cottage owner Sally Sessler with a "hot off the press" copy of the Lake Ontario Shoreline Stewardship Guide. Photo by David White, NYSG

Cottage and home owners occupy 50 percent of the 17-mile-long coastal barrier environment that stretches along Eastern Lake Ontario and includes the largest and most extensive freshwater sand dune formations in New York State. To help shoreline property owners learn about the valuable and fragile ecosystem of dunes and wetlands, New York Sea Grant and The Ontario Dune Coalition have distributed information and resource packets to landowners.

"These information packets encourage wise use and conservation. This barrier system, its wetlands and near-shore waters are vital to maintaining the natural habitats and productivity of the coastal environment and provide recreational opportunities that support our local economy," explains **David G. White** of New York Sea Grant's Great Lakes Program.

The packets include:

- Fliers describing dunes and wetlands and the processes affecting the shoreline, e.g., waves, wind, lake level fluctuation and erosion;
- "Living with the Lakes: Understanding and Adapting to Great Lakes Water Level Changes," a publication of the U.S. Army Corps of Engineers and the Great Lakes Commission;
- Suggestions and illustrations of measures to protect the environment, for example, dune stabilization through restoration plantings, fencing and walkovers;
- Fliers on invasive plant species: Purple Loosestrife, Eurasion Water Milfoil, Water Chestnut, and Hydrilla;
- A Lake Ontario Stewardship Guide, produced by New York Sea Grant, with tips for creating a wildlife friendly shoreline and a regionally-specific recommended plants list on CD;
- A packet of wildflower seeds; and
- Information on activities that are prohibited or require a permit.

"Most of the people here are interested in maintaining both the environmental quality of the land and the property value and packets such as this from New York Sea Grant are a wonderful help to us," says **Nan Winters**, Chairperson of the Private Landowners Committee of The Ontario Dunes Coalition.

Cottage owner **John Petreszyn** is known as the "Dune Saver." He belongs to the Friends of Sandy Pond that is celebrating its 10th anniversary and the planting of more than 88,000 stems of native beach grass raised by the group to protect Lake Ontario's fragile sand dunes.

"The Natural Area here looks gorgeous now," says Petreszyn, who adds that partnerships between New York Sea Grant, the Friends group, The Ontario Dune Coalition and others are a key part of the dune restoration effort. "We cannot be selfish. Any knowledge one acquires is quickly shared and supports the group effort to educate the public, school groups and beach users," he says. "One family came to plant grass on the dunes a couple of years ago as a learning experience for their children. This year they came back to buy grass for their grandmother's lakefront property."

NOAA in cooperation with the NYS Coastal Management Program and the US EPA grant provided funding for the project. The Oswego County Soil and Water Conservation District helped with preparation of the information sheets.

— Kara Lynn Dunn

Annual Report

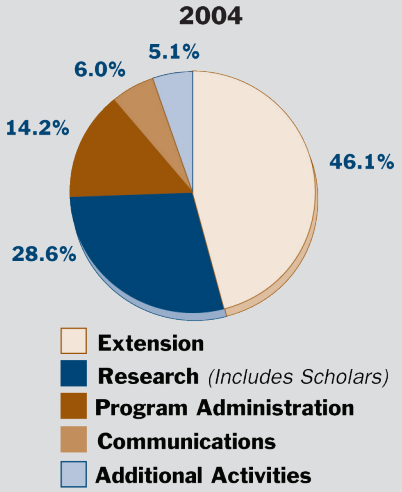
New York Sea Grant

State, Federal, and Other Funds Allocated in Calendar Year 2004 for use in 2004 and beyond*

Program Administration	
From NSGO (core) and New York State (core and/or member items)	$652,073
From NSGO initiatives and national investments	$0
From other sponsors	$59,872
Total Program Administration	$711,945
Communications	
From NSGO (core) and New York State (core and/or member items)	$271,211
From NSGO initiatives and national investments	$0
From other sponsors	$27,604
Total Communications	$298,815
Extension	
From NSGO (core) and New York State (core and/or member items)	$952,167
From NSGO initiatives and national investments	$221,293
From other sponsors	$1,138,293
Total Extension	$2,311,753
Research and Scholars	
From NSGO (core) and New York State (core and/or member items)	$1,062,036
From NSGO initiatives and national investments	$191,860
From other sponsors	$180,118
Percent of above research funds allocated to Scholars	19.62%
Total Research and Scholars	$1,434,014
Additional Activities	
From NSGO (core) and New York State (core and/or member items)	
— Fellowships	$14,451
— Other Conferences/Workshops/Special Projects	$39,999
From NSGO initiatives and national investments	
— Fellowships	$139,334
— Other Conferences/Workshops/Special Projects	$1,155
From other sponsors	
— Fellowships	$63,511
— Other Conferences/Workshops/Special Projects	$0
Total Additional Activities	$258,450
Total Funds Allocated	**$5,014,977**
Unallocated and Pending Committed Funds Carried Into 2005**	**$650,717**
Additional Non-Federal Cost-Sharing or In-Kind Support (not already included as direct support in table above)	**$1,377,507**

**"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 2005*

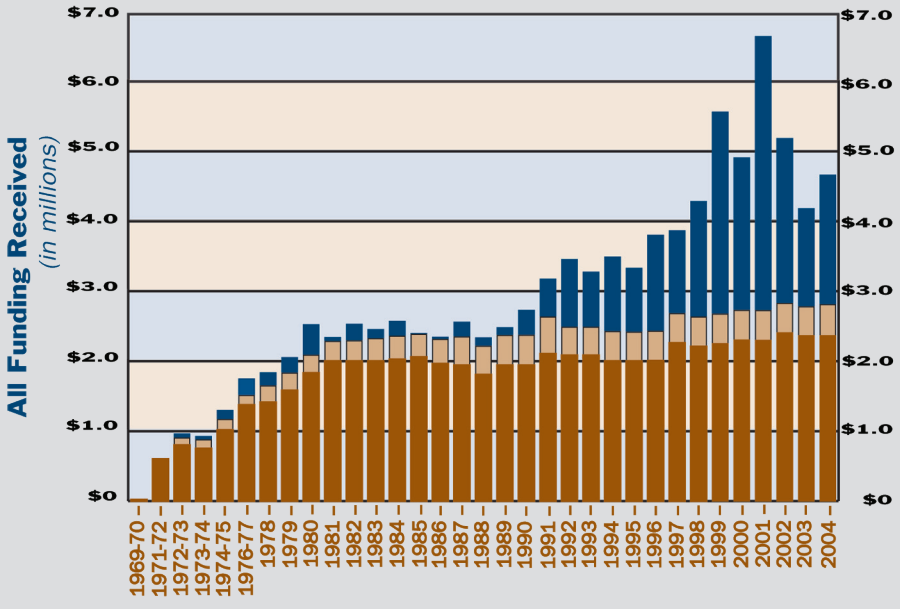
Distribution of Funding Among Program Elements



Note: In 2004, Extension received $1.1M in funding from non-core resources, resulting in a much larger percentage of NYSG's overall allocation.

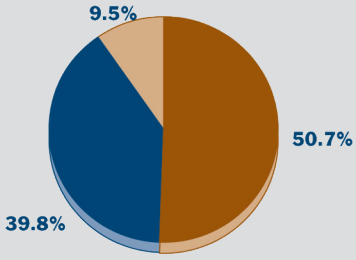
New York Sea Grant Funding

(Since Inception)



Funding Sources

(2004)



Additional Federal, State, and Other Funds
Core State Appropriation
Core Federal Award

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

— Stefanie Massucci

Explore nyseagrant.org this Autumn

- Long Island Sound Study and the NY-NJ Harbor Estuary Program announce their latest community-based mini-grant projects.
- Find out how student stewards helped protect New York's Salmon River and Lake Ontario dunes this past summer.
- In late-September, the NY-NJ Harbor Estuary will host *EstuaryLive*, a live, interactive online field trip broadcast from Liberty State Park in Jersey City, NJ designed for teachers and students.

A Technical Review of the Lake Ontario Forage Base Assessment Program. D. MacNeill. 2005. *Free.* Available in PDF format at www.nyseagrant.org/fish/forageassess05.pdf

Results are in from our first independent review of the Great Lakes forage fish assessment programs. In response to the concerns of recreational and commercial fisheries stakeholders, NYS Senator **George Maziarz** requested NYSG to organize the objective review of the USGS and NYS DEC programs that measure the fish populations and state of the freshwater ecosystem in Lake Ontario.

"This review verified the credibility of the assessment program and made valuable recommendations that have improved the programs," says author **David B. MacNeill**, a NYSG fisheries specialist.

Ordering Publications

Please send requests for the following publications to:

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

Sea Grant Publications

Establishing Local Authority for Stormwater Management. New York Sea Grant NEMO Program. 2005. Fact Sheet. *Free*

Impacts of Development on Waterways: Linking Land Use to Water Quality. New York Sea Grant NEMO Program. 2004. Fact Sheet. *Free*

The Nissequogue River: A River of Special Significance. New York Sea Grant NEMO Program. 2003. Fact Sheet. *Free*

Journal Reprints

Bioconcentration of inorganic and organic thallium by freshwater phytoplankton. 2004. M.R. Twiss, B.S. Twining, and N.S. Fisher. *Environmental Toxicology and Chemistry* 23(4): 968-973. *Free*

Comparative toxicity of thallium(I), thallium(III), and cadmium(II) to the unicellular alga *Chlorella* isolated from Lake Erie. 2002. L. Ralph, and M.R. Twiss. *Bulletin of Environmental Contamination and Toxicology* 68(2): 261-268. *Free*

Linking phytoplankton community composition with juvenile-phase growth in the northern quahog *Mercenaria mercenaria* (L). 2005. D.I. Greenfield, D.J. Lonsdale, and R.M. Cerrato. *Estuaries* 28(2): 241-251. *Free*

Oxidation of Thallium by Freshwater Plankton Communities. 2003. B.S. Twining, M.R. Twiss, and N.S. Fisher. *Environmental Science & Technology* 37(12): 2720-2726. *Free*

Partitioning of dissolved thallium by seston in Lakes Erie and Ontario. 2003. M.R. Twiss, B.S. Twining, and N.S. Fisher. *Canadian Journal of Fisheries and Aquatic Science* 60(11): 1369-1375. *Free*

Trophic transfer of trace metals from protozoa mesozooplankton. 2004. B.S. Twining, and N.S. Fisher. *Limnology and Oceanography* 49(1): 28-39. *Free*

Alewife is a crucial forage fish for Lake Ontario's salmon sport fishery.

Blackfish

Long Island is relatively central in the Atlantic coast range of *Tautoga onitis*, also known as blackfish. Virtually every wreck, rock pile, jetty or mussel bed along our shorelines has been visited by blackfish at one time or other. This places the blackfish easily within range of beach as well as boat fishermen.

Blackfish make excellent table fare with firm, sweet, white meat that is amenable to almost all styles of preparation and cooking. The low fat content of the flesh makes it a great fish for freezing.

Recent management measures (size limits, creel limits, seasonal closures and commercial trip limits) have been credited with stemming the decline of blackfish in our waters and protecting a very valuable fishery.

Prime seasons for blackfishing are spring and fall with the fall season, beginning October 1, getting the most attention. Present recreational limits are set at 10 fish per angler at 14" or greater. The fall season is rapidly approaching, so get ready for some memorable fishing and dining.

— Dean Delle Donne

An avid blackfish angler, Dean has been active in several fishing associations.

Spicy Blackfish

Seafood Corner

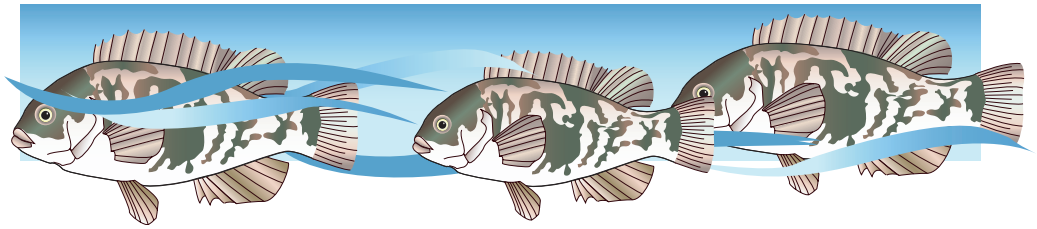
Ingredients

2 lbs. blackfish fillets
2 tbsp. olive oil
2 tbsp. soy sauce
2 tbsp. Worcestershire sauce
1 tsp. paprika
1/2 tsp. chili powder
1/2 tsp. garlic powder
1 dash hot pepper sauce

Method

Cut the fillets in single portions and place in a well-greased baking pan. Combine olive oil, soy sauce, Worcestershire sauce, paprika, chili and garlic powder and hot pepper sauce. Pour the sauce over the fillets. Broil 4 inches from the heat source for 5 minutes. Turn the fillets, baste with sauce and broil an additional 3 to 5 minutes or until fish flakes easily. Serve with lemon wedges.

Serves 4 - 6.
Recipe from "The Northeast Seafood Book," Susan M. Faria, Massachusetts Division of Marine Fisheries.



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