



Top: A breakwater protects the shore near Buffalo.
Photo by Helen Domske.

Bottom: Researchers take samples in winter aboard
the Canadian Coast Guard Cutter Griffon.
Photo by Michael Twiss

Lake Erie: Warmest is Summer, Coolest in Winter

When it's 20 below, Dr. Michael Twiss, professor at Clarkson University, has been known to clear the snow and lie down on the thick ice of a frozen lake and stare up at the Northern Lights. But for all his winter preparedness, working on a Canadian icebreaker to collect data for his NYSG-funded research project had its challenges. Bone-chilling February temps caused the shattering of tempered glass collection containers, and the occasional failure of necessary instruments like the CTD sensors that measure conductivity, temperature and depth of sea water. An ice breaker chugging along at 12 mph is a large ship, but it was never meant for research.

Why study Lake Erie in the winter?

This lake is the Great Lake most impacted by summer hypoxia—the loss of oxygen at the bottom that affects fish and other living communities—and, according to Dr. Twiss, is a good sentinel for climate change. “Lake Erie, the shallowest Great Lake, is also the coldest of all the Great Lakes in winter,” he says. “These extremes make it a good environment to predict how the lakes will change with global climate change.”

As the severity of Lake Erie harmful algal blooms has been on the rise, some would look for a link between summertime algal blooms and hypoxia. Not necessarily so, says Twiss. In fact, his results show that the amount of plankton in wintertime is greater than in summer. By taking ice samples for the last five winters and analyzing for the chlorophyll produced by algae and photosynthetic bacteria, Twiss and his team determined that from November to April the Lake experiences great primary productivity, more so than in spring or summer.

“We were surprised when we analyzed ‘dirty ice’ which we thought contained just that. Instead it contained chlorophyll, much of it from diatoms.” When they examined the water column for silica—the compound that makes up the hard supporting structure of diatoms—they didn’t find much. Rather, the silica was already mostly accumulated by the diatoms by February, and the winter-blooming diatoms were sinking to the lake sediments. Thus the winter productivity that peaks in December-January creates the source of biomass that starts the decay process and robs the bottom of oxygen. The visible algal blooms, coming months later and making headlines, are really confined to the top surface layers of the lake.

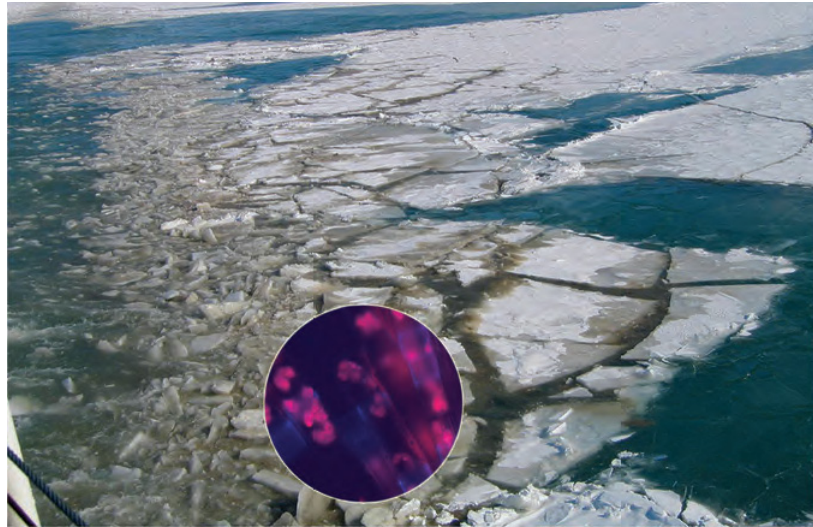
Continued on page 2

Lake Erie: Warmest in Summer, Coolest in Winter

Continued from page 1

Twiss and his crew sampled all over the lake from the Canadian Coast Guard Ship Griffon, despite the winter difficulties. But his research got a boost from Dr. Caren Binding of Environment Canada, a partner who has been able to use satellite imagery to see algae from space. Dr. Binding has been using the images from NASA and European satellites to monitor the progression of warm weather harmful algal blooms on the surface of Lake Erie since 2004. By looking at the color of the water and other data from tens of thousands of data points, she could determine the timing, intensity and extent of algal blooms. But it wasn't until she heard Dr. Twiss give results detailing the existence of winter productivity, that she began to look at images from winter months. She accompanied him the next season. The results? The sampling from the Griffon and the satellite images told the same story: winter productivity is greater than in summer months. Binding says, "You could hear the sound of ice breaking behind you and could see the bloom being released from pockets of ice as a streak of silt and diatoms." Since this study, Environment Canada has been considering greater research attention to winter productivity.

Dr. Joe DePinto, a senior scientist at LimnoTech in Ann Arbor, Michigan and former professor at U Buffalo and Clarkson, has extensive experience with aquatic research and management programs in the Great Lakes region. DePinto reports that LimnoTech is in the process of finishing the development and application of a Lake Erie Central Basin hypoxia model. In the model, the severity of hypoxia is driven by a combination of physical factors such as the thickness of the dense, bottom layer of water during stratification, the degree of wind-driven vertical mixing, and the growth of phytoplankton induced by phosphorus loading. Says DePinto, "To the extent that the winter production of phytoplankton organic matter is still available for oxygen-demanding decomposition during the summer stratified period, it will contribute to Central Basin hypoxia." Although they are not up to that stage yet, they will work with the Twiss group to do that.



The Coast Guard cutter reveals streaks of brownish silt containing filamentous diatoms as it cuts through lake ice.
Photo by Michael Twiss

Microscopic inset: Fluorescence is used to show the silica structure within filamentous diatoms.
Photo by Matthew Saxton

Twiss notes that even in the winter of 2012 when there was no ice cover, the team gleaned much from the data. Says project partner Dr. Mike McKay, Bowling Green University's Marine Science Program Director, "We have some interesting data for the winter of 2012. The most distinct trend was a decline in the abundance of large-sized, filamentous diatoms and an increase in small diatoms." This could likely have implications for the zooplankton that usually graze on larger diatoms and in turn the fish that eat those zooplankton. "However," says McKay, "We may not know the full effect for a few years when the fish that were depending on winter production from 2012 mature and are enumerated through fish surveys." Thus the entire lake food web is impacted by the degree of ice cover from year to year and the degree of winter productivity. Perhaps these year to year changes make Lake Erie a living laboratory for climate change.

—Barbara A. Branca

The entire lake food web is impacted by the degree of ice cover from year to year and the degree of winter productivity.

Sea Grant and the EPA Begin New Sound Research



Mount Sinai Harbor on Long Island's north shore, one of 50 Long Island Sound embayments being studied for the risk of eutrophication in a newly-funded research project.
Oil painting and photo by Joan Brancaon

In one of the two-year projects, researchers will estimate the risk of eutrophication for 50 embayments in the Long Island Sound region. Jamie Vaudrey, Charles Yarish and Jang Kyun Kim from the University of Connecticut, and Christopher Pickerell and Lorne Brousseau from Cornell Cooperative Extension of Suffolk County, NY, will use computer models to calculate estimates for dissolved nitrogen concentrations and freshwater flushing times for each embayment. They will also sample each embayment at dawn and slack tide during the summer hypoxia season and compare the results with existing field data. An assessment of risk for each embayment, including potential impacts to food webs, will be prepared and distributed to coastal managers.

In another project, researchers will analyze historical trends back to the 1970s to project and manage Long Island Sound's future. The research team will be led by Nickitas Georgas of Stevens Institute of Technology. Working with Alan Blumberg and Philip Orton, the team will synthesize physical data collected for Long Island Sound and global climate change indices. The computer model will first model backward in time, a process called "hindcasting."

Results will be compared to historic marine resources data from the CT Department of Energy and Environmental Protection provided by Penny Howell, and a high-resolution global climate model from Vincent Saba of NOAA's Geophysical Fluid Dynamics Laboratory in Princeton, NJ. Finally, the computer model will look forward to simulate the effects of climate

Long Island Sound's physical environment and living marine resources up to the year 2100. This multi-disciplinary approach to projecting conditions in the Sound for the rest of the 21st century is of great interest to both stakeholders and regional managers as they pursue management strategies in response to climate change.

"The information derived from these projects will be invaluable for managers dealing with critical issues affecting the health of the Sound," said Mark Tedesco, Director of EPA's Long Island Sound Office in Stamford, CT, which manages the Long Island Sound Study.

In tandem: New York and Connecticut

The Long Island Sound Study Research Grant Program is conducted by the two Sea Grant programs: New York Sea Grant, based at Stony Brook University on Long Island and Connecticut Sea Grant, based at the University of Connecticut at Avery Point. Both are part of the National Sea Grant College Program network, administered by the National Oceanic and Atmospheric Administration (NOAA). Funding for the program is provided to the Sea Grant programs by US EPA as part of the Long Island Sound Study, a cooperative effort between the EPA and the states of Connecticut and New York to restore and protect the Sound and its ecosystem.

—Barbara A. Branca

Off to Washington for Two Knauss Fellows

The Knauss Fellowship program of the National Sea Grant College Program matches highly qualified graduate students with hosts in the legislative and executive branch of government located in the Washington, D.C. area, for a one year paid fellowship. New York Sea Grant is happy to announce two Fellows were selected for this prestigious program named in honor of one of Sea Grant's founders, former NOAA Administrator, John A. Knauss. The Knauss fellowship, established in 1979, provides a unique educational experience to students who have an interest in ocean, coastal and Great Lakes resources and in the national policy decisions affecting those resources.

As a Knauss Fellow, Zachary Schulman, who earned his JD in international and environmental law at Pace University School of Law, was placed as the Executive Assistant to the Director of the Marine Transportation System of the U. S. Coast Guard. In

September, Zach will be on board the USCGC HEALY, a polar science research icebreaker. Among its other missions, the Coast Guard's NOAA partners will test out an unmanned aerial vehicle from the ship.

Daniel Sousa, who received a Masters degree in Climate and Society from Columbia University, began working for U.S. Representative Mike Thompson of California. Says Dan, "Being a legislative Knauss Fellow is a marvelous once-in-a-lifetime opportunity. I feel incredibly fortunate to work with such diverse, talented people and it is wonderful to be in a position to learn something new every day." Dan who received an undergraduate degree from the University of California, Davis, has also held a unique policy-based internship with a sustainable development effort related to coastal policy in the low lying country of Bangladesh.

— Barbara A. Branca



Top: Zachary Schulman will participate in an Arctic marine domain awareness exercise. Photo by Zachary Schulman

Bottom: Daniel Sousa attends a Knauss reception with NYSG Associate Director, Dr. Kathy Bunting-Howarth. Photo by Katherine Bunting-Howarth

NYSG Hosts LIS Workshop

At a workshop that was held on Friday, July 19th, six middle school and high school teachers learned about the Long Island Sound estuary and how they can incorporate hands-on activities like seining and water quality testing into their curricula. The teachers also learned about the horseshoe crab tagging program and got a tour of the Town of Brookhaven's clam and oyster nursery, where the Town of Brookhaven's Shellfish Mariculture Program is run. According to the program evaluations, 100 percent of the attendees indicated that they learned new information about Long Island Sound and were also exposed to new activities and materials to use in their classrooms.

This is just one of the many teacher professional development workshops being conducted along Long Island Sound, by New York Sea Grant's new LIS Coordinator, Amy Boyajian.

NYG will offer two more workshops this fall – on Saturday, September 21st and Saturday, September 28th. For more information about these workshops, please visit

www.longislandsoundstudy.net or contact Amy at acb328@cornell.edu.

— Amy Boyajian



Top: Amy Boyajian (right), worked with Eileen Gerle (in hat), at a Secondary Teacher Workshop at Cedar Beach in Mt. Sinai, NY.

Bottom: Amy and Eileen explain water quality issues. Photos courtesy Amy Boyajian

Ordering Publications...

Go to www.nyseagrant.org/pubs and click "Fill Out Our Publications Form" or email requests to: Sharon.ODonovan@stonybrook.edu. Information provided to NYSG will not be shared with any third party.

Journal Reprints

Karimi, Roxanne, Timothy P. Fitzgerald, and Nicholas S. Fisher. 2012. A Quantitative Synthesis of Mercury in Commercial Seafood and Implications for Exposure in the United States. *Environmental Health Perspectives*. 120(11): 1512-1519.

Perrigault, Mickael and Bassem Allam. 2012. Differential immune response in the hard clam (*Mercenaria mercenaria*) against bacteria and the protistan pathogen QPX (quahog parasite unknown). *Fish & Shellfish Immunology*. 32: 1124-1134.

Binding, Caren E., Tracie A. Greenberg, Robert P. Bukata, Derek E. Smith, and Michael R. Twiss. 2012. The MERIS MCI and its potential for satellite detection of winter diatom blooms on partially ice-covered Lake Erie. *Journal of Plankton Research*. 34(6): 569-573.

Saxton, Matthew A., Nigel A. D'Souza, Richard A. Bourbonniere, Robert Michael L. McKay, and Steven W. Wilhelm. 2012. Seasonal Si:C ratios in Lake Erie diatoms - Evidence of an active winter diatom community. *Journal of Great Lakes Research*. 38: 206-211.

Molloy, D.P., D.A. Mayer, M.J. Gaylo, L.E. Burlakova, A.Y. Karatayev, K.T. Presti, P.M. Sawyko, J.T. Morse, and E.A. Paul. 2013. Non-target trials with *Pseudomonas fluorescens* strain CL145A, a lethal control agent of dreissenid mussels (*Bivalvia*: Dreissenidae). *Management of Biological Invasions* 4(1): 71-79.

Anglès, Sílvia, E. Garcés, T. K. Hattenrath-Lehmann and C. J. Gobler. 2012. In situ lifecycle stages of *Alexandrium fundyense* during bloom development in Northport Harbor (New York, USA). *Harmful Algae*. 16:20-26.

Fact Sheets

Bunting-Howarth, Katherine, Robert H. Bacon, Nancy Balcom, Laura Biggs, Leon Cammen, James A. Fawcett, Paul C. Focazio, Pat Knight, Michael Liffmann, Judith Pederson, Michael Spranger, Stephanie Showalter Otts and Barbara A. Branca (Editor). 2013. *Fundamentals of a Sea Grant Extension Program*. Second Edition. NYSGI-H-13-001. 96pp.



Domske, Helen. *Lake Erie fact sheet*. 2013. 4pp. The Lake Erie fact sheet contains information on the shallowest of the Great Lakes, but one of the most productive lakes in the system. Information on the fish community, invasive species, eutrophication, dead zones and harmful algal blooms will provide interested stakeholders with a general knowledge of the lake's ecosystem and some of the ecological problems facing Lake Erie today.

Trending...

Scientists Go 'Social' with Sandy

This past Spring, NYSG's Web Content Manager Paul C. Focazio – pictured at far left, along with Jaci Clement, Fair Media Council's (FMC) Executive Director and Folio Awards co-host Steve Scott, WCBS Newsradio 880 Anchor – was recognized for NYSG's "Social-Minded Science for Superstorm Sandy" campaign.

FMC's annual Folio Awards program is adjudicated by panels of metro NY community leaders. "Their personal commitment to the betterment of the community enables them to judge entries with an emphasis on news and information that is most relevant to the public," says Clement. "Because the public is the judge, earning a Folio Award is among the highest of honors."



In mid-July, Focazio was an invited speaker on the panel discussion "How Social Media Benefited Our Organizations" at FMC's Social Media Bootcamp. Check out the Web extras from this issue of *NYCoastlines* for more on the success of NYSG's campaign, as well as for post-Sandy analysis from Stony Brook University School of Marine and Atmospheric Sciences researcher Malcolm Bowman.

Currents Spotlights Summer

Currents, NYSG's e-newsletter supplement to *NYCoastlines*, will close out the summer next month with stories on safe boating, mapping coastal change in Metro NY and the Hudson Valley, aquatic invasive species and Great Lakes teacher trainings. Both *NYCoastlines*, our flagship coastal science newsletter, and *Currents* are each e-distributed several times a year. Sign up for both at either www.nyseagrant.org/coastlines or www.nyseagrant.org/ecurrents, both of which also feature archives of these respective publications.

— Paul C. Focazio

From the Director

New York Sea Grant has experienced its share of transitioning recently. Director Jim Ammerman took a position with Stony Brook University's School of Marine and Atmospheric Sciences to lead an effort to develop closer ties between those institutions and NOAA in the matter of coastal storm forecasting, preparedness and protection. We wish Jim well in this important new endeavor and thank him for his contributions to Sea Grant in New York during his time with the program.

The New York Sea Grant Board of Governors asked me to step in as the program's Interim Director upon Jim's departure. I readily agreed. I had worked for the program from 1979 through 1986, first as Assistant Director and then as Acting Director. Having stayed close to Sea Grant over the ensuing years and having cut my eye teeth as a young professional with it, New York Sea Grant will forever occupy a warm spot in my heart. My welcome by the Sea Grant staff has been superb. Together with those fine and dedicated people, and a Board of Governors committed to Sea Grant's future in New York, I am looking forward to

providing the stability and leadership necessary to carry the program forward until a new Director is installed.

As I arrive, one of New York Sea Grant's stars is beginning to leave. Seafood Specialist Ken Gall is entering a phased retirement from our program after what can only be described as a stellar career "bringing science to the shore." In his field of serving the seafood industry and innovating the science of seafood safety, Ken has touched the lives of thousands of business owners and consumers and his impact on our program has been immense.

The smooth running of the New York Sea Grant program owes a great deal to the competence of its fiscal officer. During this time of transition, NYSG's fiscal officer, Mary Kethman, has moved on to Stony Brook University's Department of Information Technology and fiscal responsibilities are now in the very capable hands of JeanAnn Johnston. We congratulate JeanAnn on her promotion.

— Bill Wise



l-r: Cornelia Schlenk, NYSG; State Sen. Ken LaValle; Bill Wise, NYSG, SoMAS; Sen. Johnson; State Sen. John Flanagan; Dr. Minghua Zhang, SoMAS; and Jim Gilmore, NYS DEC.
Photo by Barbara A. Branca

*Transition pervades everything.
Living life is about dealing
with transitions.*



Interim Director
William Wise

Associate Director
Katherine Bunting-Howarth

Assistant Director
Cornelia Schlenk

NEW YORK COASTLINES
Vol. 30, No. 2 Spring 2016

Managing Editor/Writer
Barbara A. Branca
Barbara.Branca@stonybrook.edu

Web Content Manager/Writer
Paul C. Focazio
Paul.Focazio@stonybrook.edu

Contributing Writer
Amy Boyajian

Design and Production
Sharon A. O'Donovan
LC Graphics

Publications
Sharon A. O'Donovan



www.nyseagrant.org
New York Sea Grant provides equal opportunities in employment and programming.
New York Sea Grant Institute
121 Discovery Hall
Stony Brook University
Stony Brook, NY 11794-5001
631.632.6905
For a list of NYSG's offices and staff, click on "Contact Us" > "Staff" at www.nyseagrant.org

New York Coastlines is a product of NYSG's project C/PC-11 funded under award NA100AR4170064 granted to the Research Foundation of SUNY on behalf of NYSG from the National Sea Grant College Program of the US Dept. of Commerce's NOAA. Sea Grant is a national network of 33 university-based programs whose research and outreach programs promote better understanding, conservation and use of America's coastal resources. NYSG is a joint program of the State University of New York and Cornell University. Text and images in this publication or its electronic form may be used, reproduced or transmitted for educational purposes, giving credit to NYSG. Contact NYSG's Communications (631) 632.6916 to obtain permission from originators of all photos and artwork prior to use in any other publication or Web site.