Sea Grant New York

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New York Sea Grant Research: Results and Impacts

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Summer flounder are masters of camouflage, but can they hide from ecological pressures over time along the U.S. East Coast? NYSG-funded researchers at Stony Brook University studied water temperature impacts on summer flounder biology to assess potential impacts of changing climate. *Image credit: Chris Paparo/@fishguyphotosImpacts*

NYSG-funded researchers at SUNY-ESF studied methods to engage communities considering dam removal to restore migratory fish runs. *Image credit: Joseph A., Flickr*

Impacts of Climate Change on the Distribution, Population Connectivity, and Fisheries for Summer Flounder (Paralichthys Dentatus) in the Mid-Atlantic (*R/MARR14NJ-NY, Drs. Janet Nye and Hyemi Kim, Stony Brook University)*

How fish populations will adapt to climate change is a challenge facing fisheries managers. As part of a Mid-Atlantic Sea Grant regional project, a research team at Stony Brook University led by **Dr. Janet Nye** (now at University of North Carolina) examined the role that increased water temperature has on the biology of the economically important summer flounder. Results showed that there was a small, but significant effect of temperature on fish distribution, age-specific natural mortality and recruitment. This work demonstrates the relative importance of seawater temperature on summer flounder life history and can inform the future management of the stock.

Reconnecting Waters for Eels and River Herring: A Mediated Modeling Approach to Assess Receptivity to Dam Removal in the Hudson-Mohawk Watershed *(R/FHD-14, Drs. Karin Limburg and Andrea Feldpausch-Parker, with graduate student Kayla Smith, SUNY-ESF; Dr. Alexander Smith, New York State Department of Environmental Conservation)*

In the Hudson River watershed and elsewhere in New York, there is growing interest in removing small derelict dams in order to restore historic migratory fish runs (e.g. river herring and the American eel). A SUNY-ESF and NYSDEC research team led by **Dr. Karin Limburg** employed different educational methods to help community groups asses the "barriers and bridges" to dam removal. The participation of stakeholders in field trips, workshops and interviews proved invaluable to improved understanding of community-level interest, concerns, priorities, and tradeoffs regarding dam removal. Using this approach can help communities prioritize management actions and will ultimately help to inform state-level decision making for dam removal projects that benefit people and biodiversity.

While we cannot see submarine groundwater discharge, Stony Brook University researchers have captured photographic evidence of it via a thermal infrared camera, later combining this with measurements from the ground. *Image credit: Joseph Tamborski*

Stony Brook University investigators study harmful algal bloom dynamics (like this rust tide in Orient Harbor) and possible impacts on Long Island shellfisheries. *Image credit: Peconic Estuary Partnership*

The Role of Submarine Groundwater Discharge in Promoting Hypoxia in Smithtown Bay *(R/CMC-12, Drs. Henry Bokuniewicz, J. Kirk Cochran, and A. Deanne Rogers, Stony Brook University)*

The occurrence of very low dissolved oxygen levels (hypoxia) is a perennial problem in many coastal embayments in Long Island Sound (LIS). Excess nutrient loading in our coastal waters is the major factor contributing to hypoxia by fueling plankton blooms that result in oxygen consumption by microbial decomposition of the bloom when it dies and sinks to the sediments. A research team led by **Dr. Henry Bokuniewicz** at Stony Brook University used thermal infrared camera technology coupled with on the ground measurements, to measure a little appreciated source of nutrient input into a local LIS embayment, Smithtown Bay. This source is known as submarine groundwater discharge (SGD) – a hydrological process commonly occurring in coastal areas that consists of upwelling freshwater, re-circulated seawater, or a composite thereof. The results of the project documented the importance of nutrient input into Smithtown Bay from SGD. For example, the results show that fresh SGD accounts for inputs approximately equivalent to the discharge of the Nissequogue River with saline SGD fluxes even greater. These results demonstrate the need to consider SGD sources when managing nutrient inputs for improved water quality.

Increasing Coastal Resilience Through Facilitated Zoning Code Assessment and Amendment *(R/CHD-10, Dr. John Nolon, Ms. Jessica Bacher, Ms. Tiffany Zezula, Pace University)*

Coastal communities in NY State and throughout the nation are facing increasing risks to property and infrastructure from climate change including sea level rise, flooding events, severe storms, and ocean acidification. A research team led by **Jessica Bacher**, **John Nolan** and **Tiffany Zezula** at Pace University's Land Use Law Center (LULC) developed and implemented decision-support tools and trainings to facilitate coastal communities' efforts to assess and amend their zoning codes to increase their resilience. A product developed from the project was a set of example annotated model codes for use by coastal communities, which is publicly accessible on the LULC's web site. The trainings and tools were specifically designed to help address the need for coastal storm and sea level rise (SLR) preparedness on Long Island.

Assessing Bloom Dynamics of the Toxic Dinoflagellate, *Cochlodinium Polykrikoides* and Impacts on Fisheries: Are There Mitigation Options? *(R/CMB-40, Drs. Christopher Gobler and Ying Zhong, Stony Brook University; Dr. Sandra Shumway, University of Connecticut)*

The red tide forming dinoflagellate *Cochlodinium polykrikoides* has been responsible for fish and shellfish kills in NY coastal waters. Within the last couple of decades, the U.S east coast has experienced an increase in significant blooms. Management and mitigation of red tide blooms has been hampered by a lack of knowledge of red tide bloom dynamics. A research team led by **Dr. Christopher Gobler** at Stony Brook University conducted a study to address this knowledge gap. The research team conducted field surveys measuring horizontal and vertical distribution and migration during bloom development. The project team also conducted experiments to assess the growth and survival of shellfish under bloom conditions in both the field and laboratory. Project results revealed that cell densities during *Cochlodinium* blooms are greatest at surface layers. Accordingly, it was found that shellfish nets deployed at the surface experienced significantly more mortality than individuals deployed at depth. This work has benefit to the aquaculture industry, demonstrating that to reduce mortality during bloom events shellfish can be placed at greater depths.

Cisco, the focus of a Cornell University-led project, was once a commercially and ecologically important fish in Lake Ontario. The study described the genetic diversity of cisco populations to inform restoration efforts. *Image credit: Heather Ainsworth*

Located near Buffalo, New York, Buffalo Harbor State Park includes the Gallagher Pier — a 1,400-foot scenic shorefront popular with local and regional residents that was also the scene for a recent SUNY Buffalo State-led study. *Image credit: Office of Congressman Brian Higgins*

Identifying Genetic and Habitat Limitations to Cisco Restoration in Lake Ontario (*R/XG-23, Drs. Matt Hare and Lars Rudstam, Cornell University; Dr. Darran Crabtree, The Nature Conservancy)*

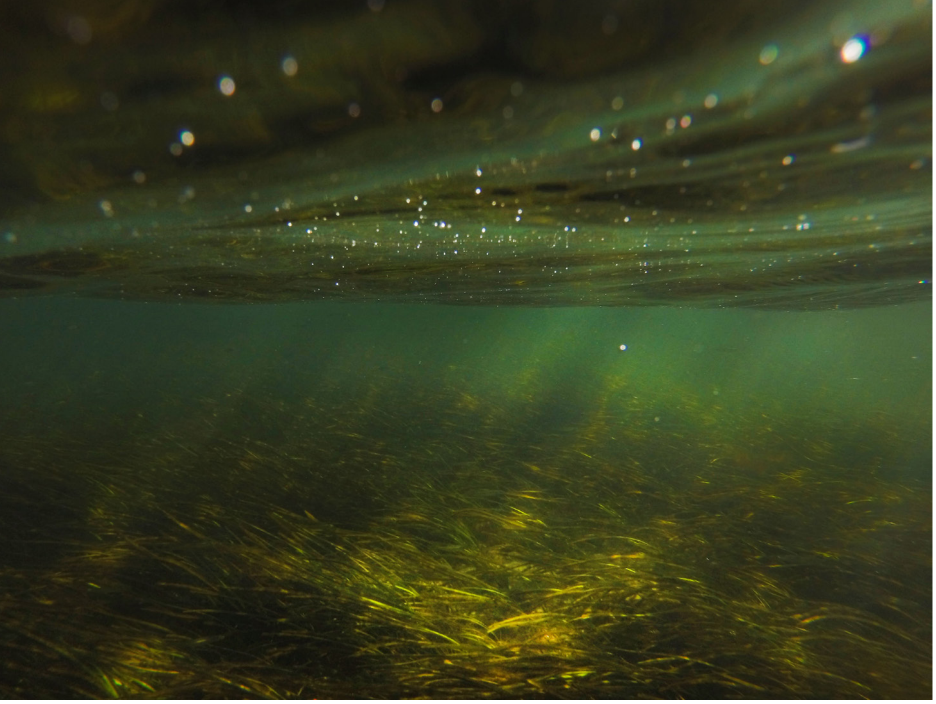
Cisco (*Coregonus artedi*) was once a commercially and ecologically important fish in Lake Ontario, before declining in the late 1800's and early 1900's due to overfishing, habitat degradation, and competition from invasive species. Interest in restoring cisco populations in Lake Ontario is growing, as it forms an important part of the native food web. However, there is concern about the genetic robustness and adaptability of cisco due to their low population size. There are questions about the level of genetic diversity and connectedness between populations, and their ability to adapt to different environmental changes. A study led by **Dr. Matthew Hare** at Cornell University compared the genetic diversity of several aggregations of cisco across Lake Ontario. The project results documented high genetic diversity and connectedness across Lake Ontario populations. The results suggest that cisco in Lake Ontario have the capacity to adapt to future environmental changes and to benefit from restoration efforts throughout the lake.

Impact of Point and Non-Point Sources on Indicator Bacteria Loading at the Gallagher Pier Area of Buffalo Harbor State Park (Erie County, NY) as Determined by Next Generation Sequencing *(R/XG-27, Drs. Gary Pettibone and Amy McMillan, SUNY Buffalo)*

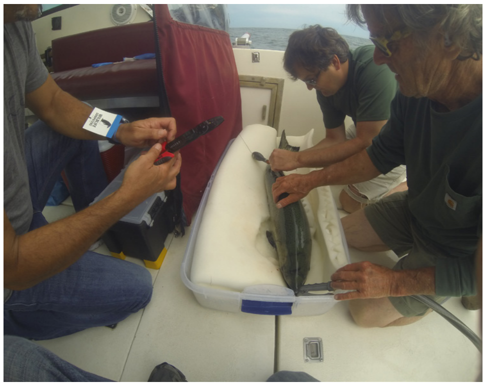
Located near Buffalo, New York, the recently established Buffalo Harbor State Park includes the Gallagher Pier, a 1,400-foot scenic shorefront that is popular with local and regional residents. The area draws kayakers and windsurfers and would be ideal for bathing, except for the presence of high bacteria levels that keep the area closed to swimming. Beach closings due to high indicator bacteria levels are common for the area during the summer months. The main source believed to contribute to the high bacterial counts is a 36-inch storm drain near the beach. Traditional scientific tests of indicator bacteria counts are not able to determine the sources of bacterial contamination. A research team consisting of **Dr. Gary Pettibone** and **Dr. Amy McMillan** of SUNY Buffalo State used Next Generation Sequencing (NGS) of the 16S rRNA gene to determine the source of high beach bacterial levels. They found that the bacterial community from the storm water outfall is distinct from the community located near the beach and likely does not contribute to the high bacterial counts there. The results demonstrate that this technique is a useful tool to help determine the origins of bacterial contamination.

Determining Degradation Rates, Products and Impacts for Prominent Plastics in Freshwater Environs (*R/CTP-53, Drs. Sherri Mason and Courtney Wigdahl-Perry, SUNY at Fredonia; Dr. Joseph Gardella, Jr., University at Buffalo*)

Recently, there has been growing concern over microplastics (plastic particles <5 mm in diameter) and their impacts in the Great Lakes. Studies have shown that most microplastic particles are small enough to be ingested by plankton and other filter feeders that form the base of lake food webs. These particles adsorb contaminants from the water and once ingested these plastics can serve as a source of organic contaminants up the food chain. A research team led by **Dr. Sherri (Sam) Mason** of SUNY Fredonia (now at Penn State, Behrend) conducted a chemical analysis of microplastics obtained from Lake Erie water samples. The team also conducted laboratory-feeding studies using a model zooplankton organism (*Daphnia magna*) to determine growth and survival rates with microplastics in their feed. Results showed that filter-feeding cladocerans consume microplastics that are the size of natural prey items and that their feeding and growth were negatively impacted. In addition, chemical analysis showed that these particles have organic pollutants adsorbed onto their surface. Results suggest that microplastics may be consumed if encountered in freshwater environments and introduce organic pollutants into the food chain.



Stony Brook University investigators report that seagrasses may provide refugia — areas of more favorable conditions for bivalve species (oysters, clams, mussels and scallops) — from the surrounding acidified waters. *Image credit: Kaitlyn O'Toole*



Cornell University investigator James Watkins (in green t-shirt) attaches a pop-off satellite archival tag to a salmon offshore of Oswego, NY in mid-July 2017 with the assistance of charter boat captain Ernie Lantiegne and researcher Chris Perle (Florida State College). These tags tracked the movements of salmon in Lake Ontario. *Image credit: Chris Marshall*

Impacts of Climate Change and Ocean Acidification on Economically Important Shellfish in New York: Are There Effective Mitigation and Adaptation Measures? *(R/FBM-38, Dr. Christopher Gobler, Stony Brook University)*

Climate change is having important impacts on coastal marine environments, including rising temperatures and carbon dioxide levels that are contributing to low oxygen levels and ocean acidification. Many resident populations of ecologically and economically important fish and shellfish species are already experiencing stressful levels of pH, dissolved oxygen (DO), and temperature. A research team led by **Dr. Christopher Gobler** at Stony Brook University conducted field and laboratory analyses to study the impacts of temperature, DO and acidification on shellfish. Laboratory results showed that acidification and hypoxia can significantly impair the normal development, growth, respiration, and survival among early life stage bivalves and these conditions together have a greater negative impact than either do separately. An additional component of the research showed that seagrasses might provide refugia for shellfish from the surrounding acidified waters. Researchers also identified a cost-effective method of treating water with sodium carbonate for hatcheries impacted by acidified seawater. Facility technicians could rapidly increase pH levels in their source water to allow for adequate larval survival.

Vertical Habitat of Salmonids in Lake Ontario Using Archival Tags and Hydrodynamic Models *(R/FBF-24, Drs. Lars Rudstam, and James Watson, Cornell University; Christopher Perle, Florida State College)*

Due to their economic and ecological importance, understanding king salmon movements and biology is important for fishery biologists and state agencies to manage the fishery. A research team Led by **Dr. Lars Rudstam** of Cornell University tracked movements of mature king salmon within Lake Ontario and its tributaries using pop-off satellite archival tags (PSATs). The tags recorded depth, temperature, light conditions, and acceleration every second to reconstruct individual movement and behavior. The results of the project have provided detailed movement data that have elucidated how salmon use the habitat and the fine-scale temperature data collected from the tags contributed to current salmon bioenergetic models. This information has helped fishery biologists with management of the stock. Additionally, testing has helped Wildlife Computers develop a new line of tags usable in freshwater environments. The collaborations with charter boat businesses during the study have helped disseminate information on salmonid behavior, thereby enhancing the client angling experience.

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