# ABSTRACTS

# 57th ANNUAL MEETING OF THE AMERICAN FISHERIES SOCIETY NEW YORK CHAPTER

# "THEN AND NOW" DYNAMIC FISHERIES IN CHANGING NY WATERS

**February 8-10, 2023**
**Stony Brook University**
**Wang Center**
**Stony Brook, NY**

# PLENARY PRESENTATIONS

## “Hudson River Fish: Now and Then”

Gregg Kenney

*Gregg Kenney is a supervising biologist who works for the Department of Environmental Conservation. His team manages the diadromous fish of the Hudson and Delaware Rivers. Gregg received a Bachelor's degree in Fish and Wildlife Biology from the University of Vermont and a Masters degree from SUNY New Paltz, while studying blue crabs in the Hudson River.*

*Gregg has worked in various capacities for the DEC since he began work there in 2000. He has spent countless pre-dawn hours in a cramped hunting check station, authored a Recovery Plan for the Northern Cricket Frog, and captured and relocated troublesome rattlesnakes and bears. More relevant to today's discussion, he also pioneered sturgeon research to develop a monitoring program for juvenile Atlantic Sturgeon which continues today, developed a sampling protocol for Hudson River blue crabs, and launched the DEC's first investigations of adult Atlantic Sturgeon with sonic tags and telemetry.*

**Gregg's talk will explore six topics relevant to the management of the diadromous fish of the Hudson River and explore how things have changed from the 1980s, 2000s and today.**

# PLENARY PRESENTATIONS

## “Then and Now, reflections on career opportunities and challenges”

Kim McKown

*Kim McKown received her B.S. degree in biology from City University of New York from Brooklyn College and her M.S. degree in Marine Environmental Science from the Marine Sciences Research Center (currently SoMAS) at Stony Brook University. Kim worked in the Division of Marine Resources, New York State Department of Environmental Conservation for over 35 years prior to her retirement in October 2022. At Marine Resources she was involved with monitoring, assessment and management of a variety of species ranging from snails to whales.*

**The theme of this year’s NY Chapter meeting, “Then and Now” Dynamic Fisheries in Changing NY Waters, is an appropriate reflection of my career. Timewise many things have changed since I worked on my Masters in the mid-1980’s, while changes in climate and management have affected fish stocks during that same time period. In some ways my career has gone in a full circle, researching sand lance (Ammodytes americanus) for my M.S to working on whales (many a predator on sand lance) near the end of my career. Important aspects of my job involved fishery monitoring, assessment and management of a number of species. I will share highlights of these activities and discuss various opportunities and challenges that I encountered along the way.**

# PLENARY PRESENTATIONS

## “Rapidly Expanding Opportunities for Fisheries Science in US Offshore Wind”

Lyndie Hice-Dunton

*Lyndie Hice-Dunton is the Executive Director of the National Offshore Wind Research and Development Consortium (Consortium). The Consortium, established in 2018, is a not-for-profit public-private partnership focused on advancing offshore wind technology in the United States through high impact research projects and cost-effective and responsible development to maximize economic benefits. Prior to joining the Consortium in 2023, Lyndie served as the Executive Director of the Responsible Offshore Science Alliance (ROSA). ROSA is a partnership formed by fishermen and offshore wind leaders, in collaboration with US federal and state management experts and others to enhance scientific understanding necessary to support the coexistence of wind energy development and sustainable fisheries. Dr. Hice-Dunton is a fisheries scientist with a multidisciplinary background in marine science, environmental policy, and offshore development. Lyndie’s offshore wind efforts have allowed her to work closely with state and federal regulatory agencies, researchers, offshore wind developers and fishing industry representatives to identify the best science-based approaches that improve our understanding of the effects of wind energy development on ocean ecosystems and support research and technology innovation. She holds a doctorate in Marine and Atmospheric Sciences from Stony Brook University.*

**Offshore wind energy is a growing industry in the US, with a federal goal of 30 gigawatts of generation capacity by 2030. Several states have adopted ambitious offshore wind goals as well. For example, New York is aiming for 9 gigawatts of offshore wind energy by 2035 and New Jersey aims to generate 11 gigawatts of offshore wind energy by 2040. Much of the focus has been on the US Atlantic, primarily in southern New England and the New York Bight, but offshore wind activity is also advancing on the Pacific coast and in the Gulf of Mexico and Hawaii. With the development of a new industry in the US, there is a critical need for research and monitoring studies to collect baseline data, as well as investigate potential impacts during and post-construction. There are also opportunities for advancements in research and technology innovation to address these needs, and for fisheries scientists to use their expertise to support evidence-based decision making to assess environmental impacts. This presentation will provide an overview of the growing offshore wind industry in the US and discuss opportunities and challenges for fisheries scientists engaged in research and monitoring in this rapidly growing field.**

# PLENARY PRESENTATIONS

## "One Angler's Voyage: People, Fishes, Politics, and Policy, Six Decades of Change"

Charles Witek

*Charles Witek is a lifelong recreational angler, who lives on the South Shore of Long Island, New York. Although he most frequently fishes his local waters, he has fished on every coast of the United States, including Alaska and Hawaii, as well as in the Caribbean. He has served as a bluefin tuna technical advisor to the U.S. ICCAT delegation, has held a seat on the Mid-Atlantic Fishery Management Council, and has testified before the House Natural Resources Subcommittee on Water, Power and Oceans, with respect to federal fisheries law. In addition to serving on New York's Marine Resources Advisory Council, he represents New York's anglers on the Atlantic States Marine Fisheries Commission's Winter Flounder and Coastal Sharks Advisory Panels. Witek is also a freelance outdoor writer, a past President of the New York State Outdoor Writers' Association, and an attorney who provides advice on salt water fisheries conservation policy, politics, legislation and related matters.*

**This talk will chronicle the changes in the recreational fishery in Connecticut and New York, including the fish available, the boats and equipment used to catch them, angler attitudes and the management environment, which has changed from virtually no regulation to the far more regulated environment that we have today. It will include the decline and, in some cases, collapse of some stocks, their recovery or non-recovery, and the appearance of other species relatively new to the region, and how those changes affected anglers. Interwoven in that will be the changing attitudes of the angling community to management, conservation, and regulation, the response of the angling industry, the changing role of management bodies and relevant laws, and the interaction of anglers with the management and fisheries research.**

# ORAL PRESENTATIONS
# *Student Presentation

## *Symposium: "Fisheries Management - Modelling and Methods"*

### Fish Stories, You Tell Them

Doug Carlson

Biology Department, State University of New York at Potsdam

Catching fish is a process and a gift. However, those partaking need to payback, by writing about their findings and making them available to others. There are many personal and professional rewards, but it is also how fisheries workers communicate and advance their science and management. Also, reports need to be archived at some level. Many professionals get stuck in a place at their job where they do not make time for this part of their performance, or they feel expectations are too high. If catching fish is "close to your heart" you should find time to write about it. This presentation today will shed light on some of the steps of writing and suggest solutions to some of the blockades that come along. When a report is done, there are truly gratifying moments that come from use of the information, often when you least expect them. Also, collaboration with other report writers (peers) can yield the most effective communication of your findings. There are many experts at these AFS meetings, and they would likely help you, like they have helped me. It is the written word that endures the test of time.

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**Development of comprehensive metadata records to facilitate historical Hudson River Biological Monitoring Program data sharing and collaborative research***

Stephanie Arsenault, Patricia Woodruff, Hsiao-yun Chang, Yong Chen

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The historical Hudson River Biological Monitoring Program (HRBMP) is a long-term survey program covering the Hudson River Estuary from Battery Park to Albany, NY and was conducted from 1974 to 2017 through six core surveys. Although these surveys follow statistical principles in their design, technical and procedural changes occurred to address issues such as logistic limitations and modified survey goals. Due to possible issues associated with survey changes, complex data structure, and lack of detailed publicly available information, the research potential of the HRBMP data has not been fully explored. Therefore, having improved information for potential users is critical to the full realization of the HRBMP potential. This calls for the development of informative and easy-to-use metadata that is available online and can be accessed by all potential end-users. The development of metadata will properly document the large quantity of environmental, spatial, temporal, and biological variables measured in these surveys and relevant background information. Metadata can help users better understand the historical HRBMP database, increase the utilization of historical HRBMP data, and promote collaborations with stakeholders and the community to address scientific and management questions critical to the Hudson River Estuary.

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# Evaluating sampling effects on survey catch rate for the Hudson River Estuary Ichthyoplankton monitoring program

Hsiao-Yun Chang[1,2], Ming Sun[1,2], Katrina Rokosz[1,2], Yong Chen[1,2]

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The Hudson River Estuary provides critical spawning and nursery habitats for many ecologically and economically important estuarine, freshwater, and diadromous fish species as well as serves social and economic services for local communities. A set of surveys were conducted for monitoring the spatiotemporal distribution and abundance of finfishes at various life stages in the Hudson River Estuary. The historical Long River Ichthyoplankton Survey was one of these surveys designed for targeting fishes at early life stages from eggs to juveniles using epibenthic sled and tucker trawl, providing a valuable long time series of data from 1974 to 2017. However, a few major logistic changes were made for the sampling design over the time. Specifically, the ranges of survey dates and area varied among years, which resulted in incomplete information on spawning season and areas and consequently inconsistent estimates of abundance for key species over time. This study evaluated the sampling effects on survey catch rates for key species at their different life stages using modeling approaches. The results can inform the use of historical data and optimization of the sampling design for the future Long River Survey.

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**Assessment of survey diel differences in estimating abundance indices for early life stages of striped bass and white perch in the Hudson River***

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The Longitudinal River Survey (LRS), part of the long-term Hudson River Biological Monitoring Program, was an ichthyoplankton survey conducted from 1974 through 2017. The LRS was designed to assess the distribution and abundance of key fish species throughout the Hudson River Estuary. Changes in sampling protocols throughout this long-term monitoring program, including sampling during different diel periods, require the dataset to be carefully evaluated for consistency. This study examines the differences in abundance indices of early life stages of striped bass (*Morone saxatilis*) and white perch (*Morone americanus*) when sampling was conducted during different diel periods. We evaluate how different sampling timings may influence estimation of abundance indices, providing insight on possible data calibration to make the data comparable over space and time. This study informs other long-term monitoring programs in optimizing data usage under protocol changes.

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# Evaluating performance of data-limited management procedures in an ecosystem perspective

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Management Strategy Evaluation evaluates the performance of alternative management strategies. However, the potential ecosystem effects of the management procedures (MPs) are less evaluated. The fishery of the large yellow croaker *Larimichthys crocea* (LYC) collapsed in the late 1980s. The species-specific assessment and management for LYC fishery were lack. In this study, an Ecopath model was built as the operating model in MSE to evaluate the effects of MPs for the LYC fishery and estimate the LYC ECC in the Min River Estuary to explore the optimal management measure. A total of 12 candidate MPs were identified and tested. A 20-year simulation showed that only 4 MPs fully achieved the performance criteria in maintaining biomass and avoiding further overfishing, including curE75, minlenLopt1, matlenLim and matlenLim2. The Ecosim model projects that the LYC biomass increased over 20% after the application of curE75, and over 37% with the combination of curE75 and national fishing moratorium policy after the 20-year simulation. The combination of releasing, fishing effort reduction and fishing moratorium is the optimal measure within current management systems for the recovery of LYC fishery in the Min River Estuary.

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**Population dynamics of weakfish in the Peconic Bay Estuary***

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Weakfish (*Cynoscion regalis*) are managed as one stock across their entire range from Cape Cod, Massachusetts to southern Florida, with their main range considered to be New York to North Carolina. Studies have evaluated weakfish recruitment throughout their central range, but knowledge of the weakfish stock-recruitment relationship specific to its northernmost range is lacking. The Peconic Bay Estuary, located between the North and South Forks of Long Island, NY, is within the northernmost primary spawning range for weakfish. We utilized the New York State Department of Environmental Conservation Peconic Bay Estuary Small Mesh Trawl Survey dataset to estimate recruitment and growth for young of the year weakfish. The survey began in 1987 and has continued to sample 16 stations weekly within the Peconics from May through October. The dataset includes 80,106 total length weakfish entries. We also explored a variety of potential environmental drivers of growth and recruitment to evaluate mechanisms of weakfish productivity. The results of this study can inform fisheries management of potential weakfish stock differences across their range and will provide insight to how climate change may impact weakfish recruitment.

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# How can we manage mixed fisheries: a global synthesis

Ming Sun[1,2], Yunzhou Li[1,2], Lisa Suatoni[3], Alexander Kempf[4], Marc Taylor[4], Elizabeth Fulton[5,6], Cody Szuwalski[7], Maria Teresa Spedicato[8], Yong Chen[1]

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Mixed fisheries occur when multispecies are harvested by multiple fleets. They are difficult to manage due to biological and technical interactions. Here we reviewed relevant policy documents and academic databases of twenty-three mixed fisheries worldwide, aiming to provide overviews on their assessment and management and identify key factors influential to management performance. We find that stock assessment and management for mixed fisheries are mainly based on single-species approaches, primarily single-species TAC and single-species assessment models. Mixed fisheries considerations in assessment and management are taken into account through a variety of approaches ranging from multispecies measures to ecosystem-based frameworks. Ecosystem-wide mixed fisheries considerations in management were found positively related to better management performance in terms of conserving stock biomass and avoiding overfishing, indicating the merits of the Ecosystem-based Fisheries Management principle. However, there is a lack of widely accepted protocols for mixed fisheries management worldwide, along with substantial research gaps in mixed fisheries by region and theme. The knowledge highlights the need of developing global consensus on best management practices and benefits from implementing EBFM, setting multi-dimensional management goals, adopting diverse and harmonized management tools, and establishing effective monitoring and control of fishing operations.

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# Developing a multi-stanza Chance and Necessity model to explore the dynamics of winter flounder from an ecosystem perspective

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Ecosystem-based approaches are becoming more frequent for management purposes. However, ecosystem models present important weaknesses that produce uncertainties in model outputs used to define management policies. Thus, new modelling approaches are developed aiming at addressing these uncertainties. Chance and Necessity (CaN), and associated models, simulate possible food-web dynamics accounting for stochastic biomass variations. Thus, CaN models explore stochastically (chance) the possible trajectories of the modelled food-web complying with physical and biological constraints (necessity). The RCaN model uses available data and expert knowledge to constrain reconstructions and allows to test for hypothesis about the past trophic dynamics of natural systems. In the Northeast US shelf, winter flounder spawning stock biomass has declined 6-fold during the last 40 years. One can use RCaN models to simulate past stock dynamics and assess the effect of multiple drivers. Available data for the RCaN model consist of stock assessment model outputs for larvae, Young-of-the-Year, and adult winter flounder, reported landings, stomach content for winter flounder and their predators, and their uncertainties. We developed a multi-stanza model to identify the effects of predation on larval/YOY stage on the spawning stock of winter flounder in the Southern New England and Mid-Atlantic Bight areas.

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# Inventory of Grass Carp Stockings In the Lower Hudson Valley

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Grass carp have been used in the United States for biological control for more than 40 years. Grass carp stockings in the northeast, particularly in New York have been a popular choice for aquatic plant management. The Lower Hudson Valley represents a lake-dense region where grass carp stockings have been popular since the early 1990s. To this date, there has been no region-wide investigation into stocking practices and trends. The goal of this study was to examine grass carp stocking patterns across Region 3 of NYSDEC. Our objective was to compile grass carp stocking records from 1991 to 2020 to provide insight into the stocking history, practices, distribution, and types of vegetation controlled. Over 125,000 triploid grass carp have been stocked in region 3 waters since 1991, with 63,000 fish stocked in water bodies over 5 acres. Out of the 177 unique water bodies over 5 acres that received grass carp stockings, only 13% provided any supplemental consulting reports/weed maps to review. Species-specific information was sparse, with many permits just listing “pondweed” or “milfoil” as the major species. Results from this study have wide-ranging implications for not only the Lower Hudson region, but also New York and the Northeast.

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**From Karl Broman's 11 unique stocks to considering how to sample for rare fish**

Nick Sard

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Sampling rare species is a fundamental problem in ecology because the quantity and quality of such efforts have conservation implications. Sampling for rare fish, whether threatened, endangered, or invasive, in some ways is embodied by the old analogy of 'looking for a needle in a haystack'. The analogy implies that the needle, or in this case fish species, is there to sample in the first place; yet this is not always the case. From a statistical perspective, a relevant question is how many samples must be collected such that there is a 95% probability that the species is absent. That is, when can we be reasonably confident that the target species does not occupy an area? Here, I describe the creation and application of an approximate Bayesian computation method to estimate the probability that a species is absent from a locale. When a rare species is surveyed with a method that has a high detection probability, results indicated that more than 335 samples with no detections are needed to be confident the species is absent. Findings from this study have broad implications for surveys of rare species.

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# Long Island's Changing Commercial Fishery

Jessica Steve, Alyssa Lefebvre, Melissa Albino Hegeman

New York State Department of Environmental Conservation

Commercial fishing has been an important part of the Long Island economy for hundreds of years. The last twenty years have seen a variety of environmental and socio-economic changes that are changing the fishing industry, including: climate change, sea level rise, and the distribution and availability of species traditionally found in New York marine waters. Using landings and permit information from NYSDEC, we'll explore how participation in commercial fisheries is changing.

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## *Symposium: "Modern Threats to Fisheries"*

### Lethal and Sublethal Effects of Polyethylene Terephthalate (PET) Microplastics (MPs) on Grass Shrimp (Palaemonetes pugio)*

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This study analyzed the lethal and sublethal effects of MP-spiked food on Grass shrimp (*Palaemonetes pugio*). Shrimp were collected from Long Island, NY, and acclimated in tanks in a laboratory. After acclimation, the tanks were divided into the two treatment groups, control and MP exposed. Shrimp were fed every other day and remained in these conditions for 35 days. After final measurements on day 35, a subset of shrimp was randomly taken out of each tank and placed into separate glass bowls without food for a video-based swimming behavior assessment the next day. Using LoliTrack v.5 tracking software, the routine swimming behavior (i.e., distance moved, mean speed, and time active) of shrimp was assessed in control conditions and again when the shrimp were exposed to a food stimulus (i.e. control seawater with dissolved food pellets). While no differences in survival and growth rates were found between treatments, significant differences in swimming behavior were found. Behavioral differences only manifested when shrimp were exposed to the food stimulus, with MP-exposed shrimp exhibiting significantly higher mean acceleration ($p=0.012$) and increased time active ($p=0.014$) compared to their baseline control behavior. As grass shrimp are important in coastal marine food webs, further investigation is warranted.

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**Assessment of Microplastics in the Eastern Oyster (Crassostrea virginica)***

Jenna DeFina, Konstantine J. Rountos

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Microplastics (MPs) have become a widespread contaminant in aquatic environments globally, particularly in bivalves. On the US East coast, there are only a few studies that have examined MP concentrations on the ecologically and economically important Eastern oyster (*Crassostrea virginica*). This study met two objectives, 1) to survey MP concentrations in oyster soft tissue from the north shore or south shore of Long Island, NY, and 2) to assess how different washing intervals would impact the MP concentrations in oyster soft tissues. For the survey, a total of 30 oysters were purchased from three local fish markets. These markets obtained their oysters from the Great South Bay (south shore of Long Island) or Long Island Sound (north shore of Long Island). For the washing experiment, a total of 50 oysters were purchased. The shucked soft tissue of each oyster was washed for different time periods (i.e. 0, 5, 10, or 30 minutes) with ten replicates for each time period being examined. There were no statistically significant differences in MP concentrations between the survey sites. In the washing experiment, oyster soft tissue washed for 5, 10, and 30 minutes all had significantly reduced MP concentrations compared to unwashed oyster soft tissues.

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**Are triploid oysters more tolerant to the parasite Perkinsus marinus than diploids?***

Christopher J. Brianik, Josh M. Lee, Dr. Bassem Allam

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Disease tolerance is a host defense strategy for which reducing the fitness costs of infection is prioritized over resistance (pathogen elimination). Sterile triploid oysters grow faster and maintain enhanced energy reserves compared to diploid oysters, however this advantage does not appear to influence disease resistance with both ploidies equally likely to become infected. Interestingly some previous work suggests triploids may display better infection tolerance after becoming infected. Using a lab-based approach, this study sought to understand if triploid oysters display better infection tolerance to the parasite *Perkinsus marinus* (Dermo), and how immunological features change throughout infection. Adult half-sibling diploid and triploid oysters were collected in April 2022, and a subset was sacrificed to assess immunological status and Dermo prevalence. The remaining oysters were then injected with Dermo (experimental) or saline water (controls), and maintained in a common garden setup monitored daily for mortality. A subset of oysters was censored after eight weeks to evaluate immunological changes, parasite loads and energetics. Results showed that triploid oysters survive significantly longer than diploids, although parasite body burdens accumulated at the same rate irrespective of ploidy, suggesting enhanced Dermo tolerance in triploid oysters. Understanding factors that influence tolerance may aid future disease management strategies.

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**The parasites of Oneida Lake fishes - then and now - a project update**

Florian Reyda

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Oneida Lake was the location of a classic parasitological study in the early 1930's which reported 34 new and many other species of parasitic worms. Oneida Lake has subsequently experienced various environmental changes, including loss of mollusk species, and arrival of various invasive species. This study, a collaboration involving multiple individuals and institutions, aims to compare the species composition of the fish parasites of Oneida Lake today to the previous study. Results of this survey are considered in the context of environmental change in this ecosystem. To date, students and I have examined >900 fish specimens representing 33 species of fish from the lake and 17 species of fish from the tributaries, for parasites. Students, other collaborators, and I have amassed a large collection of parasites. In this presentation I highlight our results at this juncture by providing examples of parasites that are still present (the trematode, *Creptotrema funduli* from banded killifish), parasites that have disappeared (the trematode, *Bucephalopsis pusilla* from walleye), and introduced parasites (the Asian fish tapeworm, *Schyzocotyle acheilognathi* from fallfish). The parasites will be considered in the context of all the hosts in their respective life cycles, providing a parasitological perspective on the Oneida system.

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**Using long-term and seasonal data to characterize nutrient balances in Duane Lake, NY***

Jessica Casey, Dan Stich

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Duane Lake is a private, artificial lake located in Schenectady County, NY and is classified as a class B lake. The lake is 120 acres, draining a 547-acre watershed composed primarily of pasture and hay fields, open water, and developed land. The lake is mainly used for fishing and for aesthetic purposes. To address concerns about harmful algal blooms, aquatic plants, and nutrients in the lake, we compiled and analyzed historical data from the lake and watershed, collected and analyzed limnological profile data, created a bathymetric map for surface area and volumetric, and developed a preliminary nutrient budget for the lake. Long-term and seasonal limnological parameters were analyzed to determine mixing regimes, potential from internal loading due to anoxia during summer months, and long-term changes in water quality parameters. Results were used to parameterize a lake loading response model and identify potential sources of nutrients in the lake. The results of this work will provide the Duane Lake Association with much of the information needed to create a 9-Element watershed management plan and will assist with management and decision making moving forward.

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# A global synthesis of climate vulnerability assessments on marine fisheries: methods, scales and knowledge co-production

Yunzhou Li[1], Ming Sun[1], Kristin Kleisner[2], Jason Link[3], Katherine Mills[4], Yong Chen[1]

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Undertaking climate vulnerability assessments (CVAs) on fisheries is instrumental to the identification of regions, species, and stakeholders at risk of impacts from climate change, and the development of targeted actions for fisheries adaptation. In this global systematic literature review, we addressed three important questions around fisheries CVA: (i) what are the common frameworks and indicators employed in various social-ecological contexts, (ii) are different geographic scales and regions adequately represented, and (iii) how do diverse knowledge systems contribute to current understanding of vulnerability? We identified and characterized an inventory of frameworks and indicators that encompass a wide range of foci on ecological and socio-economic dimensions of climate vulnerability on fisheries. Tendencies were observed regarding knowledge co-production and social-ecological integration in practice. However, our analysis cautioned a scale mismatch issue between CVA research and policy making. A climate equity problem was also revealed around the tropical island nations, which contribute the least to global CO2 emissions, experience higher climate vulnerability and risk of fisheries, but tend to have a lower level of capacity to perform contextualized CVA to support adaptation planning. We demonstrated the limits and barriers of current fisheries CVA and identified key potential areas for future applications.

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## *Symposium: "Non-native Species"*

### Mechanisms of coexistence between native and invasive pelagic fishes in Lake Champlain: analysis of a long-term acoustic and net survey*

Amelia McReynolds[1], Bernie Pientka[2], J. Michael Jech[3], Lars Rudstam[4], J. Ellen Marsden[1], Jason Stockwell[1]

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Mid-trophic level fishes are critical links in pelagic food webs that can be impacted by ecosystem change, predation, and species invasions. These factors may interact in complex, unpredictable ways to cause dramatic swings in biomass or changes in species composition of prey communities. From 1990 to 2015, hydroacoustic and midwater trawl surveys of small pelagic fishes were conducted in Lake Champlain - a large, fragmented lake comparable to the Laurentian Great Lakes. This survey encompassed a period before and during alewife (*Alosa pseudoharengus*) invasion into a forage fish community dominated by native rainbow smelt (*Osmerus mordax*). Following the invasion, rainbow smelt rapidly declined in some regions of the lake. We analyzed 11 years of hydroacoustic and net data from three ecologically distinct basins in Lake Champlain by combining machine learning and best practices for fisheries acoustic assessment developed in the Great Lakes. We quantified effects of alewife invasion on rainbow smelt by comparing distributions, oxythermal habitat use, and biomass and abundance estimates between the two species. Trends at large and small spatial scales revealed differing patterns of species' coexistence among basins. Our results suggest that alewife and rainbow smelt can effectively coexist, given sufficient oxythermal habitat for rainbow smelt.

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**The threat of northern snakehead to New York waterbodies**

Steven Pearson

New York State Department of Environmental Conservation ~~NYSDEC~~

Aquatic invasive species present a threat to New York fish communities and habitats through predation and competition. The northern snakehead (*Channa argu*s) is a fish species that threatens to alter fish communities if they establish populations. Historically, northern snakehead in NY State have been managed through eradication efforts and through monitoring of populations in isolated ponds. In the summer of 2019, 2020, and 2021, reports of northern snakehead were made from the Hudson River, the Delaware River and the Bashakill WMA, respectively. These reports led to rapid response surveys using electrofishing and environmental DNA. Hudson River watershed surveys have been negative while surveys within the Delaware River watershed have been positive. In the Bashakill WMA, eDNA surveys have shown widespread use of the habitat and in 2022, YOY were documented. eDNA surveys are being used to track the expansion of northern snakehead and monitor upstream dispersal through the Delaware and Hudson Canal into the Hudson watershed. A temporary barrier is in place and a permanent barrier is being considered. Continued surveying in the Basher Kill watershed and across NY of other reports will be necessary to prevent snakehead from establishing populations in other regions of NY State.

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# Status of Round Goby in Eastern New York

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The Round Goby (*Neogobius melanostomus*) is an invasive benthic fish indigenous to the Ponto-Caspian region of Eurasia. It recently colonized the Great Lakes and has expanded eastward through the New York State Canal System. Comprehensive studies in the Mohawk River-Eastern Erie Canal system (2016-present), Hudson River estuary (2021-present), and upper Hudson River-Champlain Canal system (2022-present) have yielded valuable information about distribution, rates of expansion, and to a lesser extent, ecological impact. Preliminary findings suggest Round Goby are patchy but widespread throughout the Mohawk River, uncommon but present in the Hudson River estuary as far downstream as Newburgh, and present in the Champlain Canal immediately downstream of the Lock C1 dam near Waterford. Together, these results suggest since being found in the Hudson River in 2021, Round Goby have expanded downstream rapidly through at least 140 km of the Hudson River estuary but have only moved upstream approximately 5 km towards Lake Champlain. Continued efforts in 2023 will focus on assessing ecological impact, viral hemorrhagic septicemia (VHS) testing, salinity trials, as well as determining the extent to which Mohawk River tributaries have been colonized and whether Round Goby have moved upstream of the Lock C1 dam on the Champlain Canal.

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**Salinity tolerance of Round Goby: informing expansion potential in the Hudson River Estuary***

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Round goby (*Neogobius melanostomus*) are one of the fastest spreading non-native fish in North America. Since their introduction in the Great Lakes in the 1990's, round goby have spread eastward across New York via the Erie Canal and were first documented in the Hudson River estuary in the summer of 2021. Questions arise as to how far throughout the estuary and connected marine environments round goby can spread given the lack of information regarding salinity tolerance of populations in North American coastal watersheds. Here we assess salinity tolerance of round goby through two, 12-week trials. Round goby were taken from two distinct locations on the eastward expansion front: Oneida lake and the Mohawk-Hudson river confluence. Study specimens were held at 20°C and subjected to regular salinity increases of 3ppt per week, concluding at 33ppt. Preliminary results revealed 0% mortality up to 24ppt, 17.5% at 27ppt, 78.5% at 30ppt, and 100% at 33ppt. A second iteration of the experiment will follow, adding temperature as a factor. These experiment results will help inform where round goby could establish in novel estuarine environments of the Hudson River estuary and connected waterways.

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**Influence of Round Gobies on VHSV Disease Ecology in the Upper St. Lawrence River***

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*Piscine novirhabdovirus*, or Viral Hemorrhagic Septicemia Virus (VHSV), is a World Organization for Animal Health (OIE) reportable fish pathogen found across the northern hemisphere. VHSV-IVb was detected in the Great Lakes following fish kills in the mid-2000's. Researchers have documented more than 30 species vulnerable to infection, high rates of genetic mutation, recurrent outbreaks, and expanding geographic range. Sensitivity to infection is variable between fishes, and factors influencing VHSV persistence are inadequately understood. In the St. Lawrence River (SLR), the invasive round goby (*Neogobius melanostomus*) is regarded as essential for the amplification, spread, and evolution of VHSV, attributed to their high susceptibility, population density, widespread distribution, and trophic significance for native piscivores. However, native fish hosts exist that can maintain this virus, therefore comparisons are needed to examine relative host competency and factors influencing viral persistence and evolution. We are using molecular techniques including RT-qPCR and Illumina sequencing to compare round gobies to native hosts in their epidemiological characteristics (i.e., prevalence, titer, viral genomic sequence). Our data illustrates that round gobies experience significantly higher viral prevalence rates and titers relative to native hosts, exposing the amplified role this invasive species has on the trajectory of VHSV persistence in the SLR.

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## *Symposium: "Acoustic Telemetry and Offshore Wind"*

### Active acoustic surveys of fish and zooplankton in the New York Bight*

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Multifrequency active acoustic surveys are commonly used to quantify fish stocks and prey aggregations throughout the water column with broad spatiotemporal coverage at fine-scale resolutions. Seasonal surveys have been conducted as a part of a multi-year monitoring program since 2018 to characterize the offshore New York Bight ecosystem. Hull-mounted echosounders measured acoustic backscatter from the water column alongside CTD casts and net tows at stations along seven transects extending from near-shore depths to the continental shelfbreak. Backscatter from the entire water column were integrated over 100 m horizontal segments to quantify broad-scale trends in relative distributions and abundances of pelagic scatterers. Organism backscatter was highest during the summer and fall surveys, which matches the timing of fish and squid migrations. Elevated 120 and 200 kHz backscatter (typically associated with crustaceans and larval fish) during the late-winter and spring surveys may correspond to spring blooms. Conversely, 38 kHz backscatter (associated with swimbladdered fish) was only elevated during the fall and summer months. Biological aggregations were often associated with bathymetric features including the shelfbreak, Hudson Canyon, and water depths shallower than 50 m. These results demonstrate the utility of acoustic backscatter surveys as ecosystem indicators.

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# Coastal movement patterns of Atlantic sturgeon within the Mid-Atlantic Bight over 12 years*

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Atlantic sturgeon, a federally listed endangered species, has been shown to exhibit broad-scale movements between rivers and coastal environments while also periodically aggregating in areas along the Atlantic coast. Despite a moratorium on fishing this species in 1998, there is little evidence of population recovery. Delayed recovery is largely attributed to life history characteristics but is exacerbated by continued anthropogenic impacts. To best manage human activities and promote recovery of the species, an understanding of their habitat use over time and space is required. Since 2010, movements of telemetered Atlantic sturgeon have been monitored within the New York Bight (NYB) through a long-term passive acoustic telemetry array resulting in 4 million detections of 718 individuals over 12 years. Residency time, rate of movement, migration patterns and timing, and spatial distribution of Atlantic Sturgeon were compared over the duration of the dataset. Overall years, mean duration of residency events is highest at arrays closest to the Hudson River, indicating that Atlantic Sturgeon aggregate before and after entering the river system. These data provide insight into the movements of Atlantic Sturgeon within the NYB and provides managers with the information needed to reduce anthropogenic impacts to promote the recovery of the species.

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**Migration dynamics and seasonal habitat use of sharks along the south shore of Long Island***

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Increased anthropogenic pressures have resulted in challenging living conditions for many marine species, especially those with slow productive life history traits like many elasmobranchs. Therefore, information regarding their migratory patterns and habitat use in heavily utilized waters is valuable for management decisions. This study investigated arrival and departure times and habitat use of dusky (*Carcharhinus obscurus*), sandbar (*Carcharhinus plumbeus*), sandtiger (*Carcharias taurus*), and thresher (*Alopias vulpinus*) sharks, and smooth (*Mustelus canis*) and spiny (*Squalus acanthias*) dogfish along the south shore of Long Island, New York, using passive acoustic telemetry data collected between 2017-2020. These species are highly migratory, though seasonally common in these temperate waters, where their ecology is poorly understood. We applied a cumulative distribution function to determine arrival and departure times of each individual and then kernel density estimates to identify patterns in the sharks' core activity space along the coastal New York region. We found that these sharks typically frequent the area between May and October and have unique species-specific habitat use patterns. This work contributes to the growing body of knowledge regarding the ecology of vulnerable shark species in waters busy with human activities and can help inform shifts in distribution.

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**South Fork Wind Telemetry Project: Pre-construction phase***

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The South Fork Wind Export Cable Telemetry Project is a multiyear, before-after control impact acoustic telemetry study to evaluate the effects of electromagnetic fields (EMF) produced by an offshore wind farm export cable on the movement and behavior of commercially important fishes. Species of interest include but are not limited to Striped Bass (*Morone saxatilis*), Summer Flounder (*Paralichthys dentatus*), Black Sea Bass (*Centropristis striata*), and local elasmobranch species. A total of 43 receivers were positioned throughout the export cable's approach to land. Seven receivers line the cable's planned position and eight receivers flank either side of the approach 0.8 kilometers east and west. A 20 receiver fine-scale positioning array is deployed around an inshore section of the cable approach to capture high-resolution movement patterns. Data for the pre-construction phase was collected from August 2021 to December 2022, resulting in nearly 2 million detections of 19 species. The initial results showed species-specific spatial-temporal movement patterns, behavior, and habitat use of the area. Acoustic data collection will continue to be collected during and after construction for comparative analyses. This research will inform wind farm cable placement and create a greater understanding of the study species with respect to EMF and movement ecology.

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**A cost-effective alternative to recovering lost, deep-water acoustic receivers**

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Acoustic telemetry is a powerful tool for exploring animal movements such as seasonal migration patterns; site fidelity; depth and temperature preference; habitat use; and rates of mortality and stocking survival. Recently, acoustic telemetry has reached new levels of popularity throughout the Great Lakes, as we endeavor to better understand and conserve native species such as lake sturgeon, lake trout, and the various coregonines. There are currently more than 2,300 acoustic receivers scattered amongst the Great Lakes, and both Lake Erie and Lake Ontario have approximately 500 each. Considering the expense of this technology and the extent of its usage, work of this nature requires a substantial financial investment. With that in mind, lost equipment represents a significant loss in terms of resources and data. Acoustic receivers can be retrieved by surface markers, underwater grapple or by automatic release mechanisms. Neither approach is immune to failure. Oftentimes, SCUBA divers can successfully search for and recover receivers. They are, however, limited by time and depth, occasionally putting missing equipment out of reach and, until recently, lost for good. Herein, we present a cost-effective alternative for recovering deep-water acoustic receivers: a comparatively inexpensive, exceptionally useful and successful, Remotely Operated Vehicle.

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**Where the wild things are: acoustic telemetry reveals differences in spawning behavior of hatchery and natural origin lake trout in Lake Champlain***

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Stocking programs are used to support many New York fish populations by supplementing native species recruitment and enhancing sport fisheries. However, hatchery rearing can lead to suboptimal behaviors for natural conditions and result in limited success restoring self-sustaining populations of native species. Lake trout in Lake Champlain were extirpated by the 1900s; reintroduction efforts began with annual stocking in the 1970s, yet substantial natural recruitment did not occur until 2015. Today, multiple year-classes of stocked and naturally produced (wild) lake trout coexist in Lake Champlain allowing behavioral comparisons between these sympatric populations. We used acoustic telemetry to determine the spawning habitat use of stocked and wild adult lake trout between 2019 and 2021. Stocked adults frequently visited known spawning sites throughout the main basins (north, central, and south) of Lake Champlain during the spawning season, while wild adults were mostly present in the central region indicating differences in habitat selection. Comparing the cumulative distance traveled and number of sites visited also suggested differences between stocked and wild adult behaviors. We hypothesize that hatchery rearing can establish behaviors in stocked fish that reduces their offspring survival and potentially delays natural recruitment.

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## *Symposium: "Genetic Studies: Progress and Development"*

### Whole-lake acoustic telemetry and eDNA to evaluate native Cisco (*Coregonus artedi*) restoration in Keuka Lake*

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Technological advances enable scientists to monitor aquatic species at greater spatial and temporal scales. We applied acoustic telemetry and environmental DNA (eDNA) to evaluate the fate of stocked Cisco (*Coregonus artedi*) in Keuka Lake. Historically, Cisco constituted an important forage resource throughout the Lake Ontario basin. By the 1990s, however, Cisco were extirpated from Keuka Lake. To restore this native fishery, 433,877 juvenile Cisco were stocked in Keuka Lake from 2018-2021. A total of 272 fish were implanted with small (0.3g, 0.6g, and 3.5g) acoustic tags and tracked across a whole-lake acoustic array. Overall, we found that stocking older, larger Cisco (age-1 fish) compared to stocking younger age-0 fish results in a longer period of survival. Both age classes also experienced significant post-release mortality, potentially due to physiological stress and predation. In 2020, we conducted an eDNA survey to validate Cisco space use and distribution against tagged fish detections across our telemetry array. eDNA detected Cisco at 12m (thermocline) and 18m (below thermocline) depths in localized regions of Keuka Lake. This project demonstrates that acoustic telemetry and eDNA technologies allow scientists and managers to observe stocked fish survival and distribution, and to inform hatchery release practices for native fish restoration.

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# Biodiversity and Distribution Estimates in a Tributary to the St. Lawrence River Using eDNA and Conventional Collection Methods

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Environmental DNA (eDNA) has great promise as a survey and assessment tool, but questions remain about how well its findings compare with conventional sampling We collected lotic fish assemblages within 22 sections of the St. Regis River watershed, using both conventional sampling methods (156 samples) and eDNA (72 samples) extracted from water samples. Conventional gear (seines, backpack or boat electrofishers, and gillnets), provided CPUE, while eDNA provided number of reads for each detectable taxon. Forty-three species were detected by both methods, four species by conventional gear only, and nine rare species by eDNA only. For 86% of species detected by both methods, eDNA detected wider distributions of species than did conventional methods. Relative abundances matched spatially or were spatially displaced for 67% of species. eDNA diversity was consistently higher than that of conventional sampling methods and was better at detecting rare species. However, eDNA was affected by large lakes and the St. Lawrence River, and lotic drift and DNA degradation must be investigated. Relative abundance estimates from eDNA must be applied with caution. Despite the caveats, eDNA can provide valuable information about lotic communities, particularly as taxa identification libraries develop more fully.

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**Assessing Lake Champlain's recovering lake trout population using next-generation genetic tools**

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Recovering populations can present a challenge to managers in that: 1) accurate information is particularly necessary to develop new management plans, 2) the system may be changing rapidly, and 3) traditional assessments may no longer capture all population components. One such example is lake trout (*Salvelinus namaycush*) in Lake Champlain. After more than 40 years of annual stocking without successful natural recruitment, multiple cohorts of wild fish have begun appearing in assessment surveys. This suggests that recovery is occurring, but also raises questions about whether stocking strategies should be adjusted to avoid overwhelming the prey base. Complicating the matter is the fact that fish are stocked by two agencies which use different strains, ages, and stocking times. To better understand the system dynamics, we are using next-generation techniques to efficiently genotype hundreds of samples and analyzing the resulting data using a combination of genetic mixed-stock analysis and close-kin mark-recapture. The former of these methods provides source-specific estimates of abundance and annual survival for stocked fish while the latter allows for estimates of the wild population size, including the abundance and source of parents contributing to successful recruitment.

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# Historical and Contemporary Demographic Events Shape the Genomic Population Structure and Patterns of Genome-Wide Heterozygosity in Southeastern Populations of Lake Charr*

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Lake Charr (*Salvelinus namaycush*) serve an important ecological role as an apex predator in many coldwater lakes and are of conservation concern following their extirpation from most of the Laurentian Great Lakes. Indeed, although nearly 70 years of restoration efforts have restored large spawning stocks, re-establishment of self-sustaining populations of Lake Charr in lakes Erie and Ontario remain elusive. An improved understanding of local and regional population structure and patterns of genetic diversity could be used to help inform management practices and improve restoration success in these lakes. However, detailed genomic data remain limited for Lake Charr, especially for populations from the southeastern portion of their range. To address this knowledge gap, we generated whole-genome resequencing data for Lake Charr from 10 populations, spanning the southeastern extent of its range, and including the 4 primary hatchery-strains used in restoration stocking efforts in lakes Erie and Ontario. We explore how historical and contemporary demographic shifts are correlated with genomic population structure and genome-wide patterns of genetic diversity and levels of inbreeding depression in Lake Charr from this region.

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**Co-evolution of Ciscoes (Coregonus spp.) and Lake Charr in the Great Lakes***

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The Laurentian Great Lakes are home to a species flock in the genus *Coregonus* ("ciscoes") and several ecomorphotypes of Lake Charr (*Salvelinus namaycush*), which occupy diverse habitats and span ecological depth gradients. To better understand the evolutionary and geological origins of these species in the Great Lakes, we used demographic modeling through whole-genome sequencing to reconstruct the history of effective population size changes in several populations. Tracing the trajectories of effective population size through time, we were able to identify a period of diversification for the cisco species complex between 80-90 ka, which is during the Last Interglacial period. We also investigated genomic variation between ciscoes to improve our understanding of underlying features that contribute to adaptive differentiation. To better contextualize cisco evolution, we also investigated the historical demography of several ecomorphotypes of their native primary predator, Lake Charr, across the same depth gradient. Demographic analyses of genomes in two Lake Charr ecomorphs revealed that this predator likely co-evolved with its cisco prey by following its food source into novel lake habitats created by glacial meltwaters. This study provides evidence that the Laurentian Great Lakes and their precursors act as an environmental driver of diversification across multiple interacting clades.

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## *Symposium: "Sturgeon: Historic Fish in a Modern Age"*

### Using Historical Lake Sturgeon Data in the Upper Niagara River to Inform Habitat Restoration Goals

Jo Johnson, Dimitry Gorsky

U.S. Fish and Wildlife Service

Spawning adult lake sturgeon (*Acipenser fulvescens*) are documented in the Buffalo Harbor, and although juvenile sturgeon have historically been observed throughout the upper Niagara River, recent sightings have been scarce. We revisited angler accounts and scientific dive data from 1994-1999 regarding juvenile lake sturgeon and habitat observations in the upper Niagara to inform a contemporary study. Baited set lines and gill nets were deployed at historical sighting locations in spring and fall of 2021-22; however, no fish were captured. We used a multibeam echosounder to collect sidescan imagery and bathymetric data for 460 hectares throughout the river, which will be integrated into a 2-D HEC-RAS model to derive bottom-depth flow estimates. Habitat is currently being characterized, and a habitat suitability index model will be developed to identify whether there is sufficient habitat available. These results will inform managers of the Great Lakes Area of Concern program, and determine whether or not habitat installation in the Niagara River is warranted to sustain early life stages of lake sturgeon. These findings are relevant for other management goals in the Niagara River, such as native mussel restoration.

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**Categorizing Behaviors of Lake Sturgeon in the Niagara River**

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U.S. Fish and Wildlife Service

Due to widespread habitat degradation and overharvesting, the lower Niagara River population of Lake Sturgeon (*Acipenser fulvescens*) is one of the few remnant populations in Lake Ontario. For nearly a decade passive acoustic telemetry has been employed to describe habitat utilization and overall movement ecology of this population. Previous research has focused on population-level seasonal residency and hot spots of river use, but examination of individual behaviors found them to widely vary, such as prolonged occupation of spawning habitat and year-round river residency. To address these differences in habitat use, individual detections of tagged fish were distilled into daily location allocations. We conducted a sequence analysis using five years of this telemetry information to identify divergent movement behaviors of 74 Lake Sturgeon tagged in the lower Niagara River, the river mouth, and out into Lake Ontario.

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**Milestones of Success: Return of Lake Sturgeon to the Genesee River, NY.**

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The Genesee River, NY is a historically productive Lake Sturgeon (*Acipenser fulvescens*) spawning tributary of Lake Ontario. With no documentation of Lake Sturgeon in the Genesee River since before 1930, the local population was officially classified as extirpated. In 1999 a multiagency collaborative research project was initiated to test restoration actions focused on returning Lake Sturgeon to the river. Multi-year habitat sampling was conducted to input data into a Lake Sturgeon habitat suitably model, which rated the river habitat as again suitable for juveniles and adults. In 2003-2004, hatchery reared juveniles were introduced. River persistence and biological characteristics of stocked Lake Sturgeon were assessed. Catch rates for juvenile fish <6 years-old are high (2.2, average number/net/24hr). Numbers decline as older fish naturally move freely into the lake. In 2021 and 2022 two key population milestones in the development of a self-reproducing local population were achieved. First, spawning condition stocked adult females and males returned to the river. Second, a small number of naturally produced juveniles were captured in the fall. This long-term research project provides documentation of milestones of success for Lake Sturgeon restoration management actions that are applicable to Great Lakes historic spawning tributaries.

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# Just how many shortnose sturgeon are out there; a non-traditional approach to estimating sturgeon in a large river system

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Shortnose Sturgeon (*Acipenser brevirostrum*) were initially listed as an endangered species in 1967 under the Endangered Species Preservation Act of 1966. Previous studies in the Hudson River indicated a substantial increase in the spawning population from the 1970's to the 1990's, which may now be the largest Shortnose Sturgeon population in the world. However, the most recent estimate is now >25 years old, and new estimates are needed to support management and recovery actions. Newer technologies are available to provide enhanced population estimates, such as integrated approaches based on side-scan sonar and acoustic telemetry which have been successfully employed in population estimates for other sturgeons. In 2021-2022, 100 adult Shortnose Sturgeon were acoustically tagged, a river-wide array and overwintering area array were deployed, and side scan surveys were conducted. Using a swept-area approach, we will estimate the number of Shortnose Sturgeon using the Esopus Meadows site. These estimates will be combined with telemetry records to estimate the proportion of the population overwintering at this location and extrapolate to a river-wide abundance estimate. Long-lived tags (10 years) will also help to improve our understanding of spawning periodicity, seasonal movement, and use of the river.

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# Reconstructing abundance indices for Atlantic Sturgeon in the Hudson River using hierarchical ecological models

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Atlantic Sturgeon *Acipenser oxyrinchus oxyrinchus* is a wide-ranging, long-lived diadromous fish that is listed as endangered in most US waters. The Hudson River, NY, contains nearly half the critical habitat within the New York Bight Distinct Population Segment, and is important for both adult spawning and juvenile rearing. To support population monitoring efforts, we used long-term, anchored gill net catch data to estimate local and reach-wide abundances of juvenile (2004-2022) and adult (2006-2022) Atlantic Sturgeon while accounting for imperfect detection within an *N*-occupancy modeling framework. Local abundance estimates for juveniles at Haverstraw Bay (river km 55-63) were similar in magnitude to standardized catch estimates and followed similar trends but were less variable from year to year when corrected for detection probability. Both local and reach-wide abundance estimates indicated juvenile abundance at Haverstraw Bay increased from 2004 through 2014 prior to declining through 2022. Preliminary estimates of local and reach-wide abundance of spawning adult Atlantic Sturgeon at Hyde Park derived from gill nets (river km 129-135 suggest that abundance increased from 2006 through 2022, and point estimates agreed well with previously published indices. Our next steps for this project include validation of the modeling approach and determination of sampling design requirements.

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# Artificial intelligence and species distribution ensemble models inform resource interactions with offshore wind*

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Development of renewable wind resources on the outer continental shelf of the US has led to growing concerns for marine wildlife. However, there remains significant uncertainty regarding the technology's potential to impact species of interest that may occupy planned development sites. This is further compounded by the difficulty of monitoring highly-migratory or data-poor species in marine waters, making practical assessment of site- or species-specific threats that could require additional management intervention particularly problematic. Here, we present a highly-generalizable framework to inform species interactions in marine habitats allocated for offshore resource exploitation, using telemetry-derived artificial intelligence (AI) species distribution ensemble models (SDEMs). Results from our case study looking at the federally protected Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) demonstrate excellent discriminatory capacity (AUC $\geq$ 0.9) at a relatively fine-scale (raster resolution = 1 km$^2$), while providing critical information on predicted occurrence over a broad swath ( > 620,000 km$^2$) of unmonitored marine habitats. Furthermore, the map products developed using AI-SDEMs are readily-scalable to ongoing management needs and, when overlaid with offshore wind energy lease areas, can feed directly into management strategies to inform best practices for potential habitat influences on Atlantic Sturgeon, as well as other species of commercial or conservation interest.

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## *Symposium: "Habitat Utilization and Restoration"*

### Update on American Eel Downstream Passage Efforts in the Lake Ontario/St Lawrence River System

Scott Schlueter, Justin Ecret

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American Eel numbers have drastically declined in Lake Ontario and the St Lawrence River. One of the reasons for the decline is turbine mortality of out-migrating eels. To address this challenge, hydroelectric producers and fisheries regulators have partnered with a goal of providing safe downstream passage. The long-term goal is to develop a method to guide, collect, and bypass eels downstream of the two mainstem hydropower facilities on the St. Lawrence River to increase escapement and mitigate turbine mortality. We will share the efforts that led to the 2022 deployment of river-scale light guidance array at the Iroquois Water Control Dam and the ongoing data evaluation of that study.

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**Carmans River Fish Passage**

Luke Gervase

GEI Consultants

Freshwater fish are now able to swim downstream from Upper Yaphank Lake in the Town of Brookhaven to the Carmans River and diadromous fish can migrate upstream to spawn for the first time in over 300 years. The Carmans River is one of only four State-designated Wild, Scenic & Recreational River Systems in New York. Construction on the fish passage that connects Lower Lake to the Carmans River began in spring 2022 and is now functioning. The project faced numerous challenges along the way and took nearly 10 years to complete the engineering design and permitting process. This presentation will briefly describe the three target fish species: alewife, brook trout, and American eel and how their swimming requirements led to the selected design. A brief history of the design process and the obstacles that were overcome to get to the start of construction will be discussed. The Carmans River Fish Passage project was spearheaded by the Suffolk County Department of Economic Development and Planning in close coordination with the Suffolk County Department of Public Works and a multiagency Project Advisory Committee. This presentation serves as an update following the construction of the fish passageway.

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**Diadromous Fish Habitat Restoration in the Peconic Estuary Watershed**

Barry Volson, Joyce Novak

Peconic Estuary Partnership

Over the last several decades the Peconic Estuary Partnership (PEP), a National Estuary Program on Long Island, New York, has been working with partners to restore historic freshwater spawning and maturation habitat for diadromous fish in the Peconic Estuary Watershed (PEW). Through the installation of fish passage structures, eg: road culverts; PEP and partners have provided several ways for diadromous fish to pass the dams to reach critical habitat. The two largest alewife spawning runs on Long Island occur in the PEW. Alewife Creek, an unobstructed run and the Peconic River, which has several barriers to alewife passage. PEP has highlighted the alewife run on the Peconic River as a priority restoration action in its conservation management plan. Of the six dams preventing fish passage on the Peconic System, four have fish passages, Grangebel (2010), Edwards Avenue (2016), Woodhull (2022), and Forge Road (2023); opening >260 acres of freshwater habitat to diadromous fish. The fish passage at the final remaining barrier received permits in 2022 and this marks last phase of river connectivity in the Peconic River system. The success of this project has been an extraordinary feat of partnership, community engagement, and financial investment in diadromous fish habitat restoration.

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# Long Island Diadromous Fish Restoration Strategy: 2023 Update

Emily Hadzopulos

Seatuck Environmental Association

Seatuck Environmental Association, which has been leading diadromous fish restoration on Long Island since 2008, launched the Long Island River Revival Project in 2017. The effort includes a public GIS map of more than 125 coastal streams in Nassau and Suffolk County, including all completed and planned passage projects, and the Long Island Diadromous Fish Restoration Strategy, a roadmap for restoring regional populations. Since the launch of these two tools, Seatuck and numerous partners in the Long Island Diadromous Fish Working Group have restored several remnant runs of river herring across the region. Seatuck would like to provide an update on these efforts, monitoring projects, and future restoration initiatives.

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**Documenting water chemistry variation across 17 Lake Ontario tributaries to aid in fish movement studies***

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The application of otolith microchemistry to reconstruct past habitat use of fishes is now a widely used technique in fisheries science. However, the technique requires knowledge of the chemical composition (e.g., trace metals) of sources of exposure to be known. In this study, water was collected from Lake Ontario and 17 tributaries across three seasons and the concentrations of magnesium, manganese, strontium, and barium were measured using Inductively Coupled Plasma Optical Emission Spectrometry (ICPOES). An average (±SD) element:calcium ratios were calculated for each tributary and a cluster analysis with similarity profile analysis (SIMPROF) was made to identify grouping among tributaries. We also collected otoliths from Rock Bass (*Ambloplites rupestris*) angled during the summer water sampling period for validation of the water/otolith relationship. Variability in element:calcium ratios among tributaries was evident. Sr:Ca appeared to show the most consistent variation among tributaries and Lake Ontario. Cluster analysis showed evidence of both grouping and outliers though a SIMPROF did not support the presence of unique clusters. Rock Bass otolith data will be analyzed in January 2023. Our work offers a broadscale view of trace metal variation and stability among multiple Lake Ontario tributaries with opportunities for use to reconstruct past fish habitat use.

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# Incorporating Multi-Passage Counts To Estimate Alewife Populations From A Fishway Camera Survey

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Accurate population estimates are needed to ensure the effective management and restoration of Alewife (*Alosa pseudoharengus*) in Long Island rivers. Fishway camera monitoring is a common method used to identify changes in annual population trends. However, multi-passage behaviors that are known to occur as individuals move between estuarine habitat and upriver spawning grounds can lead to redundant fish counts and potential overestimation of population size. Since 2020, we have used PIT tag detections to complement fishway camera surveys to estimate the Alewife population in the Peconic River, which contain one of the largest Alewife runs in Long Island. The main goal is to estimate Alewife population size and to establish a baseline prior to further upstream passage installations. Camera footage was subsampled and analyzed using a two-way stratified random sampling strategy. Rates of multi-passage varied both hourly, weekly and annually. To determine the rate of multi- counts, the proportion of first time PIT tag detections of total detections was calculated then applied to the total camera counts in two-week intervals. Incorporating annual multi-passage rates resulted in reduction ranging between 16% - 68% in the estimate of population size derived from camera counts alone.

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**A long-term monitoring program suggests decadal-scale changes in striped bass spawning strategies in the Hudson River***

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Understanding spawning behavior is critical in evaluating the productivity and vulnerability to exploitation and climate change for fish populations. Using the ichthyoplankton data collected in a long-term monitoring program, the Hudson River Biological Monitoring Program (HRBMP), we evaluated the spawning behavior of striped bass (*Morone saxatilis*), an iteroparous anadromous species with high fertility, in the Hudson River estuary. We developed three novel spawning optimum indices: the Thermal Optimum Index, the Temporal Optimum Index, and the Spatial Optimum Index. Our results showed that striped bass prefers to spawn at certain temperature ranges (14.5-17.5 C), during specific time periods (May 13-30 and June 29-July 5), but in extensive locations in the HRE. Meanwhile, the striped bass spawning behavior had changed over time, with two shifts occurring in 1985 and 1998 and resulting in three distinct periods with different spawning strategies. These changes, including a narrower range of optimal spawning temperatures and reduced diversity in spatial and temporal spawning behavior, may negatively impact the population's stability and reproductive resilience. Our study demonstrates the importance of long-term monitoring programs for fish egg occurrence and abundance to understand long-term spawning strategies in striped bass and highlights the importance of considering spawning behavior in fisheries management.

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# Single Spawning Event of Lake Ontario Deepwater Sculpin Supported by Histological Analysis*

Jarrod Ludwig[1], Brian Weidel[2], Brian O'Malley[2], Mike Connerton[3], Jacques Rinchard[1]

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Considered extirpated from Lake Ontario until the late 1990s, Deepwater Sculpin have naturally repopulated the lake since then. As their reproduction is poorly described, we investigated their gonadal development and fecundity to better understand their resurgence. From 2018 to 2021, Deepwater Sculpin were collected from Lake Ontario in spring and fall using bottom trawling. To evaluate the duration of their spawning period and if females spawn several times during their spawning period, we examined their gonadosomatic index (GSI = gonad weight x 100/body weight), gonadal development, and fecundity. Our data showed that female GSI remained elevated in fall (8.1 ± 6.2%) and spring (4.4 ± 4.3%). Absolute fecundity, measured as the number of the largest oocytes present in the ovary, averaged 763 ± 246 and relative fecundity 19 ± 6 oocytes per gram of fish. The histological analysis revealed the presence of only one batch of developing oocytes in the ovary. We suggest Deepwater Sculpin spawn once annually but have a protracted spawning season. These data provide insight on their reproductive strategy and can be contrasted with the ones of the declining slimy sculpin and the abundant round goby populations for potential reasons of their resurgence in Lake Ontario.

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# Seasonal habitat use and site fidelity of Cisco *Coregonus artedi* in Lake Ontario

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The Lake Ontario Cisco *Coregonus artedi* population declined in the 20th century, and restoration of this species is a management objective. Sporadic recruitment appears to prevent population growth to historic levels, but our poor understanding of habitat use limits studies focused on recruitment mechanisms. We characterized seasonal habitat use from 2016 - 2021, using 76 acoustic-tagged Cisco from a remnant population tagged in Chaumont Bay, Lake Ontario. We also used fine-scale acoustic telemetry, coregonine egg collections, and trap net catches to better understand Cisco spawning behaviors related to spawn timing and spawning site selection. Network analysis and Bayesian standard ellipse area indicated that Cisco utilization of lake regions and thermal-bathymetric niche space varied by season. During spawning periods, Cisco concentrated in Chaumont Bay over shallow (~3m) rocky shoals where cisco egg deposition was the greatest. Among Cisco surviving consecutive spawning years (n = 23), spawning site fidelity to Chaumont Bay was 100%. Post spawn, individual Cisco had differential, yet consistent, annual migrations to separate regions of Lake Ontario, suggesting fidelity to feeding sites. Our results reveal seasonal habitats used by Cisco and, importantly, caution that environmental changes to one spawning site could have population-level effects on Lake Ontario Cisco.

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## *Symposium: "Trophic Ecology"*

### Exploring the trophic ecology of troutperch and their role in coupling disparate lake food webs

Justin Lesser, Elenore Alves, Chris Floreani, Allie Shiers, Jason D. Stockwell, J. Ellen Marsden

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Troutperch (*Percopsis omiscomaycus*) is an abundant benthic prey fish species often found in deeper regions of large lake ecosystems. However, troutperch appear to rarely be consumed by proximate deepwater predators, making the function of troutperch in energy flow through lake ecosystems an open question. Evidence suggests that troutperch may participate in littoral food webs by migrating from deep water into shallow areas to feed at night. However, little is known about troutperch ecology or their potential role in nearshore food webs. We used troutperch abundance estimates, diet, and benthic invertebrate community surveys to (1) assess troutperch trophic ecology in Lake Champlain and (2) determine whether deepwater prey resources were sufficient for troutperch production or supplemental nearshore prey resources were required to support troutperch biomass. Results suggest that littoral migrations may be required to sustain troutperch populations, and therefore that troutperch transport allochthonous energy across lake habitat boundaries. This study is one of exceedingly few that have examined the trophic ecology of troutperch in deep lakes, and fundamentally improves our understanding of energy flow and coupling between distinct large lake food webs.

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# The diet of Lake Trout from Otsego Lake, NY: stomach contents, biochemical, and isotopic tracers*

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Otsego Lake, located in east-central New York, has experienced multiple non-native species introductions since the 1800s. Alewife, an invasive species introduced around 1986 and extirpated by 2012, caused adverse changes within the lake including: un-balancing the food web and becoming the main diet of the Lake Trout population. However, Lake Trout diet since Alewife's extirpation remains largely unknown. The objective of this study is to determine the diet of Lake Trout using stomach content (SCA), fatty acid (FAA), and stable isotope (SIA) analyses. This presentation will show preliminary results from fall 2021 (Lake Trout/prey) and spring/summer 2022 (prey) collections. Lake Trout SCA reflects a diet composed primarily of Yellow Perch (63.6%, wet weight), Sunfish (16.2%), and Lake Trout eggs (13.7%). SIA showed Slimy Sculpin (28.7%), Rainbow Smelt (24.2%), and Bluegill (16.2%) as dominant prey. FAA showed Yellow Perch and Slimy Sculpin as likely prey. These results suggest that the fall diet of Lake Trout (SCA) is from nearshore resources, while long term trends (SIA/FAA) indicate prey from deeper water. Otsego Lake is a constantly changing ecosystem; this study provides an overdue update on the current diet of lake trout for the future management of this keystone sportfish.

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# Acquisition of thiamin by wild Lake Trout eggs and free embryos reared in Lake Champlain*

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Thiamin Deficiency Complex (TDC) is an impediment to Lake Trout restoration, with acute, often lethal, symptoms in newly hatched embryos. Thiamin is naturally available in waters and zooplankton consumed by Lake Trout free embryos in Lake Champlain. We hypothesize Lake Trout embryos can acquire ambient thiamin during incubation or after hatching. Eggs from twenty females captured in Lake Champlain during fall 2021 were fertilized and split into two groups. Eggs were incubated on a reef in mesh bags that allowed interstitial water and plankton to pass freely, and in a hatchery using dechlorinated water devoid of potential prey. Thiamin concentrations (nmol/g dry weight) of wild-reared embryos increased throughout development (from 14.2 before fertilization, to 32.6 after hatching, and 55.1 five weeks after hatch) in contrast to lab-reared embryos (14.16, 5.81, and 13.30, respectively). Dissolved thiamin concentrations in both lab and reef water were low ($\leq$0.8pM), but thiamin's biosynthetic precursor moieties and degradation products were one to two orders of magnitude more concentrated than thiamin in the same environments. This suggests rapid assimilation of free thiamin resulting in low ambient concentrations. Our findings suggest Lake Trout eggs and free embryos do acquire thiamin during development, potentially mitigating TDC.

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**Spatial Considerations in the Evaluation of Juvenile Atlantic cod (Gadus morhua) Habitat Suitability and Diet Composition in the Gulf of Maine***

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Misalignment between fisheries management and biological units has surfaced as a potentially significant obstacle in the recovery of collapsed stocks such as Atlantic cod (*Gadus morhua*). A recent reevaluation of cod stock structure found that within the Gulf of Maine (GOM) management unit, there are two separate biological units in the eastern (EGOM) and western (WGOM) regions. These two areas differ in their composition of habitat type and prey species, which is likely to result in unique use of space and resources. When habitat use and diet composition are evaluated based on the entire GOM management unit, these unique trends occurring within each of the biological units, especially in the comparatively under-sampled EGOM, are not identified. This study utilizes NEFSC Bottom Trawl Survey data to conduct habitat suitability and prey composition analyses for the GOM, WGOM and EGOM units in order to identify the impact of ignoring biological stock structure on our understanding of juvenile cod habitat and prey composition. Identifying spatially explicit trends may help explain the lack of recovery of cod in this region and help inform management that aims to facilitate population growth by improving habitat and prey quantity and quality.

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**Taking an energetic approach to predicting habitat suitability: the interactive roles of temperature and food availability in bivalve development***

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Although the impact of temperature on bivalve larvae development is well studied, less attention is placed on food availability. Assessing interactive effects of temperature and food availability may allow for improved management for declining bivalve fisheries including that of the Atlantic surfclam, *Spisula solidisima solidissima*. A laboratory experiment applying a unique experimental design was used to predict survival, growth and pelagic larval duration (PLD) as functions of temperature and food availability niches for larval surfclams. Larvae were exposed to a continuous range of temperatures (14-26°C) and food availability levels (chlorophyll concentrations of 0.2-8.0 micrograms/liter) to create generalized additive models (GAMs) that showed temperature and food availability explain a large proportion of the variation in surfclam larvae growth and pelagic larval duration, but moderate variation in survival. Growth and survival increased while PLD decreased with increased food availability. Survival decreased with increased temperature, growth peaked near 23°C and PLD was lowest near 23°C. Preliminary habitat suitability modeling suggests Georges Bank conditions yield highest survival, and inner shelf New York waters yield the lowest PLD and highest growth rates. Additionally, mid-shelf Middle Atlantic Bight waters yield the lowest survival, while coastal Gulf of Maine yields the highest PLD and lowest growth rates.

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# POSTER PRESENTATIONS

## Soundscapes of the Hudson River Estuary: Science Collaboration for bioacoustics research, management, and education

Aaron Rice, Alex Flecker, Patrick Baker, Suresh Sethi, Maija Niemisto, Chris Bowser, Otse Attah

New York State Department of Environmental Conservation and Cornell University

The use of passive acoustic monitoring on the Hudson River provides an exciting opportunity to engage key stakeholders and end users in the overlapping perspectives of education/outreach and scientific data collection to inform fisheries management. The Hudson River National Estuarine Research Reserve has a diverse stakeholder constituency, along with critical fisheries management goals. We have been expanding our passive acoustic surveys to cover a broader section of the Hudson River Estuary and adjacent habitats to understand the seasonal and spatial use patterns of important migratory fishes. Additionally, this technology results in underwater audio recordings useful in education modules for K-12 students and the general public to provide engagement centered around underwater soundscapes. The expansion of aquatic passive acoustic techniques in Hudson River Estuary research project helps establish this growing technology as a strategic approach for science, resource management, and engagement.

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# Phototaxic response of Cisco larvae

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United States Geological Survey

Our observations during Cisco larval collections in Chaumont Bay, Lake Ontario, suggests that during development, fry phototaxis changes from light attraction to light avoidance. Understanding when this behavior takes place has implications for survey and management techniques of this species. We exposed cisco fry to three different light conditions in a controlled laboratory experiment. At 50 days post-hatch, we moved fry to round tanks (95L) set for the light treatments: 24 hours/day white light, 24 hours/day red light (representing dark conditions), and 12 hour light/dark cycles. Cameras in each tank took continuous photos and the water columns were divided into bottom (0-8cm from bottom), middle (8cm-16cm), and top (16cm-surface) sections. Using a random subset of the photos, we are analyzing the number of Cisco in each section of the water column as a proportion of the total number of fry in the photo frame. Visual observations suggest an affinity for the surface during dark periods, but preliminary analyses are inconclusive. Our results will be an implied phototaxis pattern at known ages and in different light treatments, informing post-hatch and diel timing of field collection, as well as collection techniques, in future surveys.

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**Effects of summer drought on native and invasive stream fish populations within Schoharie creek and two tributaries***

Elijah Creedon

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The increased frequency of drought poses a major threat to aquatic ecosystem diversity in the Northeast. In the summer of 2022, several Schoharie Creek tributaries went dry. We examined how this drought event impacted the native fish community and two recently introduced fish species, Rainbow Darter *Etheostoma caeruleum* and Oriental Weatherfish *Misgurnus anguillicaudatus*. We used Visible Implant Elastomer (VIE) tagging on Rainbow Darter to track movement and population size, but also recorded all fish captured during electrofishing. The tributaries dried between capture events and no Rainbow Darters were recaptured. A large drop in all fish species CPUE was observed in Fly Creek from 2021 (pre-drought) to 2022 (to post-drought) and 8 species were temporarily extirpated. No change was observed in Schoharie Creek mainstem fish community. The only observed increase in CPUE post drought was that of the Oriental Weatherfish. This is most likely due to its drought tolerance and preference for lentic conditions. Summer drought spells can have significant ecological impacts to low order streams in the northeast. If such events continue or increase in prevalence, stream fish communities can be expected to decline in diversity and become more vulnerable to increase in Oriental Weatherfish populations.

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# Potential impacts of ocean warming on the trophic control of a threatened marine ecosystem*

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Trophic controls determine how ecosystems work and shape the approach of managing living resources. However, current research on trophic control is limited to certain species groups, and little is known about its response to climate changes and anthropogenic stressors. In this study, we aimed to evaluate the potential impacts of ocean warming on the trophic control in a heavily exploited marine ecosystem, and evaluate the effects of fishing on the sensitivity of trophic control mechanisms. Based on ecological network analysis theory, we developed the Trophic Control Coefficient as an index to directly assess the pattern and strength of trophic control at the whole ecosystem scale. Results showed that the changes in trophic control would be negligible under the SSP1-2.6 climate scenario, whereas the increased temperature would largely enhance the existing bottom-up control in the ecosystem under the SSP5-8.5 scenario. Moreover, fishing could increase the sensitivity of trophic control to climate warming with a nonlinear pattern, and a 50% reduction of current fishing pressure might be a critical threshold for supporting ecosystem stability. Our findings advance the understanding of the mechanism of warming effects on marine ecosystems, and highlight the role of fisheries management in strengthening ecosystem resilience to climate changes.

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# Diel Diet of Swallowtail Shiner in Little York Lake

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The Swallowtail Shiner is a species of concern in the state of New York, with little known about its life history. In August 2017, we sampled the diel feeding ecology of Swallowtail shiner (*Notropis procne*) from Little York Lake, NY. Of the six time periods examined, Swallowtail shiner consumed the least at night (2400-h and 0400-h). At 0400-h, Ostracods were consumed in the highest proportions. At 0800, Chironomids and Heptageniid mayflies were the greatest portion of the diet. From 1200-2000-h Baetid mayflies and Amphipods were the most frequent diet items. At the 2400-h period mostly Amphipoda and Heptageniid mayflies were consumed. Twenty-two taxa were available to Swallowtail Shiner from the drift or benthos. There was a moderate preference by Swallowtail Shiner for food from the drift (0.40 ± 0.11), with Ostracods, Heptageniid mayflies, and Amphipods representing the preferred taxa. Swallowtail Shiners in Little York Lake selected only a few specific prey items from the available taxa. These findings can help managers support the Swallowtail Shiner population, by adjusting or creating plans to help support the dominate prey items the fish select. Future steps could be taken to assess Swallowtail Shiner habitat limitations.

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# Dace Hybridization and Diet Comparison

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Observations of hybridization in stream fishes are uncommon and little is known about potential ecological differences from the parent species. The diets of Finescale Dace (*Chrosomus neogaeus*), Redbelly Dace (*Chrosomus eos*), and their hybrid offspring, and available food were examined in the Oswegatchie watershed of Upstate New York at three different sites. All three taxa occurred at two sites and only the purebred species at the other. Available invertebrate food was generally similar at all sites (Bray-Curtis similarity of 0.56), dominated by Chironomidae, Copepoda, and Ostracoda. Both the purebred and hybrid fishes consumed significantly more ($p=0.049$) plants or detritus than invertebrates. Despite general similarity, dace diets were different in every site, except for hybrid and Redbelly Dace diets at one site (Bray-Cutris similarity of 0.53), which were dominated by both detritus and plant matter. Among the invertebrate prey, there were clear preferences that varied between both sites and species. Our results provide an insight into food preferences and possible resource partitioning among these species and their hybrid.

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# FEEDING OFF FIRE ISLAND: A DIET SUMMARY OF SEASONAL ELASMOBRANCHS ON THE SOUTH SHORE OF LONG ISLAND

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From mid-June to late September, the South Shore of Long Island hosts a widely understudied population of highly mobile shark species. Direct foraging behavior in these marine predators has been historically difficult to observe due to limits in applicable methodology. New advances in eDNA have opened the possibility of using rRNA metabarcoding to gain diet summaries in high taxonomic resolution from cloacal swabs. Using this technique on animals with recorded size and estimated body mass has allowed us to assemble seasonal dietary niches for juvenile Dusky sharks (*C. obscurus*) off of New York waters. By tagging these individuals with internal acoustic transmitters, we plan to combine our diet analysis with fine-scale movement data from VPS arrays placed on NY's network of artificial reefs. Thus, we aim to categorize these species' foraging behavior on and off structure.

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**Does length-at-age of burbot differ between two isolated and trophically dissimilar basins of Lake Champlain?***

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Burbot (*Lota lota*) is a piscivore native to higher latitude cold freshwater systems across the globe, including Lake Champlain, but little is known about their ecology and role as a top predator. Lake Champlain (1,250 $km^2$) is highly fragmented, with five ecologically distinct basins. Burbot occur throughout the lake, including two basins differing in bathymetry, productivity, and prey availability. The Main Lake is deeper, less productive, and contains higher densities of rainbow smelt (*Osmerus mordax*) and *Mysis diluviana* than the Inland Sea. We examined burbot diet and growth rates in each basin. We estimated age and diet composition for >100 burbot captured by gillnet and bottom trawling in summer and fall of 2021 and 2022 to quantify differences in burbot ecology through ontogeny and between the two distinct basins. Burbot ages were estimated by two readers, and an age-length key was constructed and applied to >200 burbot captured between 2015-2021. Results from our work will inform ongoing efforts to model coldwater pelagic food webs of Lake Champlain to better understand predator-prey dynamics in large lakes.

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# Using Environmental DNA to Determine Brook Trout Distribution in Ausable Basin, NY

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Ausable River Association

Brook Trout *Salvelinus fontinalis* is a species of greatest conservation need in New York State's 6-million-acre Adirondack Park. The Eastern Brook Trout Joint Venture recognizes warming waters and non-native trout as primary threats to Brook Trout in New York State. Understanding spatial distribution and habitat occupancy of native Brook Trout and nonnative Brown Trout *Salmo trutta* and Rainbow Trout *Oncorhynchus mykiss* is an important component of prioritizing conservation strategies to protect wild native fish. Since 2017, Ausable River Association has used environmental DNA to map the distribution of trout in the Ausable and Boquet River watersheds in the Adirondack Mountains of New York. Research across a larger spatial scale has allowed for a clear understanding of (1) the spatial extent of current Brook Trout habitat, and (2) areas where nonnative trout species move into wild Brook Trout habitat in the Adirondack Park. Our 'snapshot' of brook trout distribution in protected headwaters will be used to understand future population changes in a changing climate. Environmental DNA is an essential tool to identify and prioritize areas for habitat restoration projects in these watersheds. These research results guide our work to protect and enhance brook trout habitat across the Adirondack Park.

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# Freshwater fishes of Long Island and NYC

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Freshwater or inland fishes of Long Island and New York City inhabit over 500 lakes and 50 km of streams. Of the 49 species with recruitment or residency for spawning, only two, American Shad and Rainbow Smelt are known to have been displaced by the many decades of urban growth. Of the 47 species or taxa with sustained populations or spawners, three are unique to this region of New York State and can be readily surveyed but are considered as special concern or threatened. Nearly half of them are non-native, and many of them provide valuable sport fisheries, ecosystem functions and discovery for fish enthusiasts. Illustrations of each species are provided on the poster and annotations are found in an attachment. Some of the more noteworthy native species include American Eel, Alewife, Banded Sunfish, Swamp Darter and Pirate Perch.

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**Comparing Ecological Parameters Associated with Riparian Zones and Brook Trout Presence***

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Brook trout (*Salvelinus fontinalis*) are experiencing habitat loss throughout much of the Northeastern United States, largely due to their sensitivity to warming stream temperatures and increase in sedimentation. In this study, we aim to assess riparian characteristics and in-stream habitat of two adjacent, similar sized streams in the Upper Susquehanna Watershed, one in which brook trout have disappeared and one that retains healthy populations. In each stream three sites were randomly selected representing an upper, middle, and lower reach of each stream. At each site we measured canopy cover, thermal regime, substrate composition, and conducted electroshocking. In the stream with extant trout populations, we observed significantly lower daily temperature fluctuations and peak daily temperatures, higher percent canopy cover, and almost no siltation. The stream where trout have been extirpated has a higher percentage of agriculture within 100' of the stream and has transformed into a warmwater fishery containing several species of centrarchid. Our results support restoring forested riparian stream buffers because they stabilize stream banks, limiting erosion from surface water runoff, and provide shade that decreases daily temperature fluctuations. Adopting a 100’ forested riparian buffer is a vital management practice for the conservation of sensitive cold-water fish species.

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**Microhabitat selectivity of the Yellow Lampmussel in Schoharie Creek***

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Freshwater mussels are one of the most imperiled taxa globally. In New York yellow lampmussels have recently been elevated to a Species of Greatest Conservation Need, and additional life history information is needed for their conservation and management. The goal of this study was to examine the microhabitat preference of yellow lampmussel in Schoharie Creek. Substrate, velocity, and depth were compared between four sites with and four sites without yellow lampmussels. To quantify substrate a standard brass testing sieve was used to categorize substrate into six different size classes and a flow probe to measure velocity directly at the location where the mussel was found. Substrate and velocity were recorded at four random locations at sites without mussels. There was a significant difference between velocities and depths at mussel sites and non-mussel sites. Substrate results showed that large cobble was not a preferred habitat and that yellow lampmussels select areas protected from high flows. If propagated yellow lampmussels are to be reintroduced, our results suggest that locations should be selected that are dominated by sand and gravel and located in stream reaches with lower velocity. We observed that these conditions are often found downstream of gravel bars.

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**A comparison of natural and man-made structures for habitat enhancement to promote Yellow Perch spawning success***

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Habitat enhancements are often implemented by fisheries managers to increase fish production. Specifically, introductions of various materials may be used to augment spawning structures for yellow perch (P*erca flavescens*). The eggs of Yellow Perch are deposited in rope-like masses called “skeins” onto structures in the water column, suspended off the bottom substrate. Suspension of eggs in the water column allows for increased fertilization, increased oxygenation, prevention of suffocation due to siltation, and reduction of pathogen infection. In the spring of 2022, we compared skein deposition rates between man-made structures (porcupine cribs) and adjacent natural structures (conifer trees) that were introduced into Fancher Pond in Central New York. Examination of three paired sites revealed that 10 skeins were deposited on the conifer trees and 0 skeins were deposited on the porcupine cribs. We concluded that yellow perch exhibit a significant preference for natural conifer trees over man-made porcupine cribs for skein deposition ($P < 0.05$), likely due to the increased structural complexity of the conifer trees. These findings provide guidance and insight into the use of introduced structures for augmenting the spawning success of this ecologically, economically, and socially important species.

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**Multi-year Assessment of Walleye Spawning in the Black River**

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Walleye are a native resident of Lake Ontario that represent a significant sport fishery interest in the region, and opportunities to enhance Walleye production are of particular importance to managers and the public. The lower reaches of the Black River, a NY tributary of Lake Ontario, holds previously documented Walleye spawning habitat that was recently enhanced with reef habitat improvement sites to increase Lake Ontario Walleye production. Prior to habitat improvement, Walleye spawning in the Black River was assessed weekly with egg blocks across several spawning seasons to determine temporal and spatial distribution. Walleye larvae were also collected with drift and ichthyoplankton nets to verify spawning success in the river. Egg distribution varied within each spawning season and between seasons. In some seasons, recorded production was high in downstream sample sites near the primary area of planned habitat improvement. However, in other seasons production downstream was relatively low, and higher upstream near the Dexter, NY dam, the focal area for historic spawning. High-quality spawning habitat was added near the river mouth in 2022 and spawning assessments in subsequent seasons will quantify enhancement of Lake Ontario Walleye production associated with the improved habitat.

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# It’s a hard rock life...or is it? Influence of substrate addition on Chaumont Bay coregonine egg deposition.

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Lake Ontario coregonine populations dramatically declined across the 20th century. Many factors likely limit these populations, but current studies on egg distribution and larval emergence suggest anthropogenic changes to spawning and egg incubation habitat could be preventing substantial recruitment. Contemporary studies show coregonine egg deposition and larval emergence are highest on rock or dreissenid mussel dominated substrates from 2 - 5m. To test the role of substrate on egg survival, we experimentally added substrate at four depths (2-6m) on a known spawning shoal in Chaumont Bay, Lake Ontario. We quantified coregonine egg deposition on the four constructed reefs as well as four control sites off-reef. We hypothesized the newly added cobble substrate would facilitate higher egg incubation and survival because Lake Ontario coregonines are lithophilic fishes, and increased substrate interstitial depth should protect incubating eggs. Our results show that traps on the experimental reefs collected statistically significant fewer eggs than traps on adjacent control sites. Decreased egg abundance on treatment reefs could indicate eggs deposited on the experimental reefs were held within its interstices and were not available to egg traps. Larval emergence studies in the spring of 2023 will help elucidate the relationship between substrate and incubation success.

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# Comparing Aquatic Invertebrate Populations between Restored and Unrestored Streams*

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Stream restoration is a widely used technique for improving aquatic habitats; however, the benefit to stream invertebrates is relatively unknown. Hurricane Irene degraded Schoharie County streams by significantly scouring stream beds and banks. Restoration projects have been conducted on several streams to replace instream habitat. Our goal was to compare invertebrate communities in restored versus degraded, unrestored streams. We used a surber sampler at three restored and three unrestored sites. At each site three samples were collected in riffle habitat so we could calculate the density, biotic water quality index (BWQI), standing crop biomass, Ephemeroptera-Plecoptera-Trichoptera (EPT), and Shannon Weaver diversity index. A two-sample t-test found significantly higher levels of BWQI and standing crop biomass, and no significant difference between the density, EPT, and Shannon Weaver diversity index. The recovering ecosystem created variable invertebrate communities which did not lead to conclusive results about the benefits of stream restoration. These restoration projects were likely more focused on bank stabilization and not on ideal invertebrate habitats. In future restoration projects, a more ecological approach should be taken, such as the inclusion of woody debris and improvement of riparian areas to promote allochthonous material to maximize the benefit to invertebrates.

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**Comparing Fish Communities in Restored and Unrestored Streams***

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Since Hurricane Irene hit Schoharie County in 2011, millions of dollars have been spent on stream restoration efforts; however, many streams remain degraded. The goal of this study was to compare the fish communities to determine if restored streams exhibit higher diversity and abundance. To conduct this study we sampled three streams restored in 2015; Line Creek, Platterkill, and Little Schoharie Creek, and three unrestored creeks; Cobleskill Creek, Bear Kill, and Keyser Kill. The fish sampling was conducted by backpack electroshocking. Using the data from the fish populations, catch per hour of all fish, catch per hour of game fish, and Shannon Weaver Diversity Index values were calculated for each stream, and a t-test was used to explore for differences between restored and unrestored streams. When comparing the average values from the restored streams and unrestored streams there was no significant difference between any of the variables we examined. This is mainly due to the high variation in fish populations at both restored and unrestored streams. While many benefits occur from stream restoration this study found that it does not lead to significant differences in fish diversity and abundance.

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# NYSDEC Great South Bay Beam Trawl Survey

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The purpose of the New York State Department of Environmental Conservation (NYSDEC) led Great South Bay (GSB) Beam Trawl Survey is to monitor the annual relative abundance of blue crab (*Callinectes sapidus*) and other commercially and recreationally important finfish and invertebrate species in GSB. Stony Brook University's School of Marine and Atmospheric Sciences (SoMAS) designed this survey as part of a MOU with NYSDEC in 2013. SoMAS sampled GSB from 2014-2016 and since 2017, NYSDEC has continued this long-term fisheries independent monitoring program. The sample area, gear, and methodology, developed by SoMAS, remain the same. The sample area for this survey is the GSB (excluding its creeks, rivers, and inlets) extending from Babylon to Smith Point. For each sampling day, department personnel conduct a series of trawls using a single 2-meter-wide beam trawl. All marine invertebrates and finfish are identified and counted from each tow haul. A random sample of up to 30 individuals is measured for total lengths. Sample data are analyzed to monitor species composition, length frequencies, geospatial distributions, as well as monthly and annual trends of CPUE.

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# Exploring species richness and evenness in Jamaica Bay over the past four decades.

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The New York State Department of Environmental Conservation has been collecting biological and environmental data in Jamaica Bay as part of its Western Long Island Seine Survey since 1984. Scientists have anecdotally noticed changes in the number of unique species that have been present over time. This poster aims to examine finfish species richness and evenness over time in this estuarine ecosystem using a variety of indices including the Shannon-Weiner Species Diversity Index.

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# The Great Lakes Lake Trout Thiamine Monitoring Program: Long Term Trends and Ecological Connections.

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Efforts to restore Lake Trout (*Salvelinus namaycush*) populations in the Great Lakes have been ongoing since the early 1970s, following their near extirpation in the 1950s. A major impediment to the return of natural recruitment has been thiamine deficiency complex (TDC). Insufficient maternal deposition of thiamine (vitamin $B_1$) into eggs is a major consequence of TDC and can lead to mass mortality of fry prior to their first feeding. Therefore, monitoring of egg thiamine concentrations is a critical indicator of TDC impacts on Lake Trout populations. Since 2001, the USGS Great Lakes Science Center in cooperation with partner agencies has monitored the egg thiamine concentrations in lake trout eggs throughout the Great Lakes region. The resulting dataset demonstrates high spatial and temporal variability in Lake Trout egg thiamine concentrations. This presentation covers temporal trends in egg thiamine concentrations observed by the Great Lakes Lake Trout Thiamin Monitoring Program and potential connections to prey base dynamics.

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# From baby fish to large pelagics: Gathering baseline data for offshore fish and zooplankton in the New York Bight

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The New York Offshore Indicators project is a collaboration between Stony Brook University's School of Marine and Atmospheric Sciences and the New York State Department of Environmental Conservation. Project goals are to address ecosystem-based knowledge gaps in the offshore waters of the New York Bight, including abundance and distribution of pelagic fish and squid, as well as zooplankton. Study design includes four seasonal offshore surveys per year, covering seven transect lines from south of Long Island to the shelfbreak, and 39 hydrographic stations, to capture trends in ecosystem parameters. Vertical net tows, active acoustics, and fish trawls collect data specific to zooplankton and pelagic fish distributions. Preliminary results suggest taxa-specific spatial and seasonal patterns in distribution and abundance.Continued data collection over the next several years will provide additional baseline data to assess natural and anthropogenic ecosystem changes in the New York Bight.

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**NYSDEC Shark and Sturgeon Salvage Program**

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The salvage program exists to collect and recover valuable biological data on shark and sturgeon that have washed up on New York's shores which are used for research and management purposes. NYSDEC works collaboratively with several agencies and research organizations to accomplish these goals and the program relies largely on public involvement for reporting mortality events. When responding to an incident, DEC staff collect location, species, and length data for each individual animal. If the animal is in good condition, biological samples such as fin clips, tissue samples, and vertebrae will be retrieved by DEC staff. DEC distributes these samples to a wide network of researchers to aid and facilitate their studies. Staff will also investigate body condition to identify any evidence of what may have caused the mortality. Pathology exams are performed on certain shark samples by a consulting Veterinary Pathologist when causes of mortality are not immediately evident. The continued goals of this program are to assist and promote research and conservation of sharks and sturgeon.

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# Are Lake Whitefish a Conservation Concern in Lake Ontario?

Samantha LaSalle, Brian Weidel, Brian O'Malley, Lucas Le Tarte, Matthew Nguyen

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Lake Whitefish (*Coregonus clupeaformis*) once had a large population throughout Lake Ontario, but current population estimates suggest a decrease in U.S. Lake Whitefish abundance with sporadic recruitment. Impediments to Lake Whitefish recruitment may occur at the early life stages where research is generally lacking. In Lake Ontario, early life history studies indicate spatial distribution of spawning has been reduced and spawning habitat may be limiting. In 2018 larval sampling conducted throughout the lake collected 1,001 coregonid larvae and after genetic testing only 58 samples were found to be Lake Whitefish. Gillnetting completed in select Lake Ontario bays found 13 Lake Whitefish in 2018 and 2019 with none being caught in 2022. Similarly, in 2021, we sampled egg deposition in Chaumont Bay, Lake Ontario, and found Lake Whitefish were less than 1% of egg deposition. Lake Whitefish are an economically, ecologically, and culturally important species in Lake Ontario and further understanding mechanisms leading to their population decline are important to conserve or restore this native species.

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# Comparative analysis of a Bayesian Stochastic Stock Reduction model and modern stock assessment methods for predicting historic biomass*

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The significance of well-documented fishery landings and biomass data, and the lack thereof, has become increasingly apparent through the modernization of fisheries management. The resulting cursory population histories influence accepted abundance baselines of population model estimates used to establish stock management goals and strategies, while gaps of information can limit the utilization of highly parameterized models. In the search for data-limited methods for estimating historic fisheries abundance, Bayesian stochastic stock reduction analysis has the potential to be a useful tool. This method applies a simple logistic model using current life history parameters and historic catch data to estimate the most likely past biomass. Here, we investigate how this method performs alongside other methods used in recent fishery assessments for Atlantic Cod, Atlantic Sturgeon, and Atlantic Menhaden. The application of BSSRA to project historic abundances can educate fisheries officials when establishing baseline thresholds or species biomass potential. Ultimately, having a model for estimating past biomass with limited parameterization requirements allows for greater knowledge of past conditions to inform present management.

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# An evaluation of size at stocking of hatchery reared trout

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The New York State Department of Environmental Conservation (NYSDEC) allocates considerable resources to stock trout in its streams annually. A Trout Stream Management Plan was introduced in 2020 with an objective to increase the minimum length of stocked trout to 229 mm (i.e., target length); however, an evaluation of this objective is pending. Therefore, our objectives were to evaluate mean lengths, cumulative length frequencies, and the temporal changes in size at stocking for stream stocked trout in New York State. Prior to stocking, 6,475 trout were measured from seven NYSDEC Hatcheries. Mean lengths were significantly different among hatcheries for all three species. Overall, 44% of Brook Trout, 73% of Rainbow Trout, and 52% of Brown Trout were above the target length with variability among hatcheries. Logistic regression analysis suggested that stocking date influenced the probability that a stocked trout be at or above the target length, with Rainbow and Brown Trout both increasing more than 20% throughout the stocking season. The Trout Stream Management Plan aims to stock larger trout with the goal of improving recreational potential. Our results suggest that Rainbow Trout consistently meet the target length while approximately half of Brook and Brown Trout reach this goal.

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# Assessing the Efficacy of a Catch and Release Section on Chittenango Creek

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Chittenango Creek is a premier trout stream located in Madison and Onondaga Counties. The creek has 4.8 miles of Public Fishing Rights (PFR) 2.2 miles of which are designated as a Catch-and-Release (C&R) only section. This regulation was implemented with the goal of increasing the density and size structure of the brown trout population within the C&R section. We established two standard sites in the C&R section to measure the progress of this regulation that were sampled during late summer in 2009, 2013, 2016 2018, 2020, and 2022. A third site was added in 2020 and sampled along with sites 1 and 2. Length structures and density estimates were determined annually, and we have detected no impact on the trout population since this regulation was implemented. The regulation will continue to be monitored every 2 years.

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**Sodus Bay Coregonines: Past, Present, and Future**

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Coregonines such as Cisco, *Coregonus artedi*, and Lake Whitefish, *Coregonus clupeaformis*, were once common throughout Lake Ontario. Coregonines are most often found in pelagic waters but use shoreline embayments to spawn. Sodus Bay, located on the Southern shore of Lake Ontario, is one where historical accounts and images describe large coregonine fisheries. Recent gillnetting surveys and studies of egg deposition in Sodus Bay indicate that coregonine spawning abundance has dropped from what it once was. Stocking of coregonines has been implemented in an attempt to improve the spawning population within Sodus Bay, though evidence indicates that these stocking efforts may not be effective in cultivating a natural recruitment of coregonine populations. This may be the result of high predator populations within Sodus Bay, who eat the stocked coregonines and adults when they return to spawn. Studies of egg deposition within the bay indicate that spawning habitat may be of low quality, which is consistent with the hypothesis that spawning substrate is an important impediment. Some management actions currently being considered include substrate remediation, where interstitial space is improved in substrates for the eggs to incubate, as well as substrate additions, which would provide coregonines with ideal spawning habitat within Sodus.

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# Spawning Alewife Passage through Rock Ramp Fishway at Peconic River (Long Island, NY) is Efficient and Exhibits Multi-Passage Behavior*

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Nature-like fishways simulate natural stretches of stream and bypass dams. The few studies to date that evaluated passage efficacy have reported mixed success. A nature-like rock ramp fishway installed in 2010 on the Peconic River, which hosts the second largest spawning run on Long Island, bypasses the first of five dams allowing access to 25 acres of freshwater habitat. Beginning in 2017 we monitored passage of spawning Alewife through the fishway using PIT-tags and report here results for 2020-2022. An antenna near the upstream exit of the fishway was installed in 2017 and a second antenna downstream was installed in 2021. 1166 spawning Alewife captured above the fishway were tagged and released in 2018, 2019, and 2021. 20 and 9% of Alewife released in the prior year were detected in 2020 and 2022, respectively. Alewife exhibited multiple passages through the fishway (3 and 5 mean detections/fish for 2020 and 2022). Alewife detected >1X remained in or near the spawning habitat for 2 (2022) to 3 (2020) weeks on average. Passage efficiencies measured in 2021 and 2022 were 82 and 88%, respectively. Multiple passages may reflect ease of passage and the small amount of spawning habitat currently available in the river.

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# Evaluation of a bedrock falls potential to serve as barrier to fish passage

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The New York State Department of Environmental Conservation Region 4 Ecosystem Health unit partnered with Trout Unlimited to conduct a study on the passability of a potential bedrock barrier wall within Hughes Brook. Just upstream of this potential natural bedrock barrier was a perched culvert that was under consideration for replacement. Determination of the passability of the bedrock section was needed prior to assessing the value of correcting the culvert. The bedrock falls in question is 4-foot-high and is located 140 feet downstream of the perched culvert. To determine passability of the bedrock; 41 Brook Trout were surgically tagged with 12mm passive integrated transponders over the course of two years and returned to the downstream bedrock pool. During the two-year monitoring period, eight tagged fish that passed over the bedrock falls were detected by a radio frequency identification unit (RFID) installed upstream. During the second monitoring year, a motion camera was installed at the RFID antenna to disprove that fish were moved by some other means. Fish detected ranged from 134mm to 198mm. It is critical during the decision-making process for culvert connectivity projects to identify natural barriers and determine what their actual effects are on stream continuity.

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# Utilizing Size Indices and Catch Rate Data to Evaluate the Condition of Northern Snakeheads in NYC

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In 2005, the New York State Department of Environmental Conservation (NYSDEC) captured three, adult Northern snakeheads (*Channa argus*) in a fyke net deployed within the Meadow/Willow lakes system in Queens, NY. Signifying the first confirmed record of this species in New York State, the NYSDEC responded by conducting annual electrofishing surveys to assess the population of all fish species and remove snakeheads from these waterbodies. Since then, 128 Northern snakeheads have been captured as a result of these survey efforts. Notably, 23.6% of snakeheads captured during this survey period exceeded the trophy-size threshold (700mm) for this species. Additionally, average relative weight for all snakeheads ($W_t$=101.7) was calculated using the standard-weight equation as log 10 (W s) =-5.142 + 3.0418 * log 10 (TL). Calculated size metrics combined with catch-per-unit-effort (CPUE) data from these surveys suggests that the abundance of forage combined with the lack of interspecific competition have contributed to the robust population of Northern snakeheads present in Meadow and Willow Lakes.

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**Spawning Population of Northern Snakehead found in the Bashakill Wildlife Management Area**

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Northern Snakehead (*Channa argus*) is an invasive species of fish from Asia first documented in the United States in 2002 and the Delaware River in 2004. Their range has since expanded upstream in the Delaware, with confirmed reports in New York waters in 2020. In August 2021, NYSDEC collected a Northern Snakehead caught by an angler in the Bashakill WMA, a large wetland complex connected to the Delaware River via the Neversink River and Basher Kill. This prompted extensive boat electrofishing of the marsh by NYSDEC Fisheries staff, in conjunction with eDNA sampling by NYSDEC's Invasive Species Unit. Though no snakeheads were captured via electrofishing, eDNA results indicated they were present in the system. In 2022, NYSDEC received another adult snakehead and young-of-year were observed. Fisheries staff responded, observing five fry balls in the marsh, most guarded by an adult. Over 2000 YOY snakehead were then collected by dip net and an adult was caught via angling. With a spawning population now established in the Bashakill WMA, future sampling strategies are needed to evaluate impacts on existing fish and wildlife. Lastly, special considerations must be made regarding the prevention of the Northern Snakehead expansion into other waterbodies in the state.

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# eDNA monitoring reveals patchy, but widespread distribution of Round Goby throughout upper 2/3 of the tidal Hudson River

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Round Goby (*Neogobious melanostomous*) was first detected in the tidal Hudson River near Albany, NY in 2021 during NYSDEC's annual beach seine surveys. A total of 112 round goby were captured between June and October 2021, primarily in the Albany and Poughkeepsie regions. In 2022, we sought to determine the feasibility of Round Goby eDNA monitoring in the tidal Hudson and to further examine their presence and potential range expansion by conducting eDNA (qPCR) sampling at select beach seine sites and at additional locations of interest (i.e. Troy, Catskill to Kingston, LI Sound, and select tributaries). Round Goby eDNA was detected from Troy to Newburgh demonstrating a larger spatial distribution of Round Goby than previously documented at beach seine locations. eDNA was also detected in 1 of 6 tributaries indicating potential lateral expansion beyond the Hudson River. No eDNA was detected in the brackish river region (Haverstraw, Tappan Zee, LI Sound) consistent with the absence of Round Goby in beach seining sampling. This study demonstrates the feasibility of eDNA monitoring for a cryptic species in low abundance and within a large river system, and its utility to complement traditional fish sampling as an early detection method for non-native species.

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**Provenance of Hudson-Mohawk Round Gobies Determined by Otolith Chemistry**

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Round Goby *Neogobius melanostomus* have been steadily expanding from the Great Lakes to eastern New York largely via the New York State Canal System. In 2021, Round Goby were detected in the tidal Hudson River during NYSDEC's annual beach seine monitoring. The known southern extent of the invasion (north of Newburgh, NY, ca. river km 105) suggested potential rapid, long range (~140 km) movement from a source population on the Erie Canal, yet the size and maturity of individuals captured also suggested a previously established reproductively mature population in the Hudson River. We assayed otolith chemistry of a dozen individuals. Core chemistry identified at least four spawning sources: Mohawk River, Hudson River, an unknown water body, and possibly as far away as Oneida Lake or east thereof. As in other systems, Round Goby appear to be colonizing rapidly.

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**Monitoring the effects of walleye on salmonine populations in Skaneateles lake**

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Skaneateles Lake has a rich history of providing a high-quality coldwater fishery consisting of stocked rainbow trout (*Oncorhynchus mykiss*), stocked Atlantic salmon (*Salmo salar*), and self-sustaining native lake trout (*Salvelinus namaycush*). In recent years, angler diary data has demonstrated steep declines in angler catch rates of rainbow trout and Atlantic salmon. Following rumors of illegal walleye introduction and anecdotal reports of walleye in the lake, combined with the declining catch rates for rainbow trout and Atlantic salmon, DEC conducted netting surveys that ultimately confirmed the presence of walleye in the lake in 2017. Cohort analysis and increasing catch rates of walleye indicate that walleye have been present in the lake since at least 2011 and that the population is likely contributing to the decreased catch rates of salmonines due to post-stocking predation on them. We've conducted annual monitoring to identify walleye spawning locations, abundance, age structure and condition, and implemented new fishing regulations on walleye with the goal of limiting the population in the lake to reestablish the coldwater fishery.

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**Assessment of thiamin deficiency in steelhead trout eggs***

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In this study, we measured thiamin concentrations in steelhead trout eggs collected at the Salmon River Fish Hatchery between 2015 and 2022. Eggs were fertilized in 2015, 2016, 2017, 2022, and incubated to determine offspring survival and the lethal concentration causing 50% of offspring mortality (LC50). Egg thiamin concentrations were also assessed in steelhead trout from Lake Michigan: Little Manistee River, St. Joseph's River, and Kewaunee River. A new LC50 was determined at 5.4 nmol/g, lower than the previously estimated concentration. In Lake Ontario, egg thiamin concentrations varied significantly among years, with the highest concentrations reported in 2016 and the lowest in 2020. A substantial number of fish (84.5 ± 17.9%) produced eggs below the LC50 across all years. Average egg thiamin concentrations from all Lake Michigan sites were significantly higher than the ones reported in Lake Ontario and were above the LC50. Finally, we found that yearly fatty acid signatures in eggs significantly differed among years and fatty acids most responsible were 22:6n-3, 18:1n-9, 20:5n-3, and 16:0. Although these results suggest a potential shift in steelhead diet, average egg thiamin concentrations were below the LC50 across years and further investigations are required to determine how diet affects thiamin concentration.

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# Analyzing Historical Atlantic Tomcod Monitoring Program Data to Understand Their Changes in Abundance and Distribution in the Hudson River*

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The Atlantic tomcod (*Microgadus tomcod*) is a member of the cod family (Gadidae) that is distributed from southern Labrador to the Chesapeake Bay. In the Hudson River ecosystem, tomcods are present only at the mouth of the Hudson River Estuary (HRE). However, research is limited in the HRE due to their small size, presumably mid-winter spawning habits, and lack of commercial and recreational fisheries. The historical Hudson River Biological Monitoring Program surveyed tomcod abundance and distribution throughout the year from 1973 to 2017, from December to February. Atlantic tomcod of different life stages (eggs to spawning adults) were collected, as well as other biological samples such as otoliths, stomach contents, and information on fecundity, liver tumors, and parasites. This study examines Atlantic tomcod's spatio-temporal distribution and develops an abundance index to quantify tomcod stock dynamics in the HRE. This provides insight into an improved understanding of the Hudson River ecosystem. Further studies on identifying key environmental drivers that may influence the dynamics of Hudson River tomcod stock are recommended.

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# Influence of statistical deviation of historical catch on stock assessment: a case study of western Atlantic Thunnus thynnus*

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Misreporting is one of the causes of statistical deviation of historical catch, which is currently prevalent in all types of fisheries worldwide. In this study, a stock assessment on western Atlantic bluefin tuna (*Thunnus thynnus*) using Age-Structured Assessment Program (ASAP) was carried out to investigate the effects of catch information inaccuracy on the assessment results by setting different levels of statistical deviation of historical catch. The results indicate that the estimated values of fishing mortality (*F*) and spawning stock biomass (*SSB*) changed in the same direction with the adjusted catch. With the increase of statistical deviation of catch, the relative difference of biological reference points also increased. The relative deviation rate of *F*-related biological reference points was less than 1% under all eight assumed statistical deviations of catch. When the statistical deviation of the historical catch was assumed as -20%, the maximum relative difference of *SSB*-related biological reference points was about 4%. The statistical deviation of catch had a more obvious impact on *SSB*-related biological reference points than *F*-related biological reference points. It is suggested to strengthen the source analysis of catch data quality issues while the scientific reconstruction of historical fishery data could be conducted if possible.

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# Caught on camera: monitoring adult Atlantic Sturgeon breaching in the Hudson River

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Sturgeons have yet to attain the moniker as a high-performance fish, many species are capable of impressive feats of swimming performance including long-distance migrations and acrobatic breaching events. Airborne breaching events increase the probability of interactions (including injury and death) between sturgeons and humans, which can both complicate and slow recovery for imperiled species. While Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) breaching events have been documented since colonial times, quantitative data to understand the factors mediating this behavior are limited. To address this data gap, we mounted a remote high-definition camera system to document Atlantic Sturgeon breaching during the likely spawning period in the Hudson River. This camera system is part of a proof-of-concept effort to explore the viability of incorporating non-traditional data sources to track recovery in this enigmatic species. Our findings suggest that remotely sensed data can be used to monitoring breaching events. We will discuss challenges to this approach as well as our plans to expand the project during the summer of 2023. Our collaborative approach includes state, academic, and federal scientists working in conjunction with private individuals and organizations and may provide a roadmap for improving recovery prospects in this species through citizen buy-in and engagement.

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# Has the size structure of spawning Atlantic Sturgeon in the Hudson River changed following decades of conservation measures?

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Atlantic sturgeon populations were heavily exploited starting in the late 1800s, with directed fisheries targeting greatly reduced populations until the 1990's. In the Hudson River, all directed fisheries were closed in 1996, followed by a coastwide moratorium on all harvest in 1998. In the decades since, Atlantic sturgeon have been listed under the Endangered Species Act and considerable resources have been devoted to their conservation, but population trajectories remain poorly understood. As a long-lived species with slow growth rates, the size structure of spawning adults is likely to be sensitive to changes in mortality rates. We used a multidecadal gill net survey that targets adults near the spawning grounds to test for changes in size structure over time, which may be indicative of reduced mortality following the cessation of targeted fisheries.

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# Developing an end-to-end model to simulate the dynamics of Hudson River and New York Bight ecosystem*

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The Hudson River (HR) and New York Bight (NYB) provide critical habitats for many ecologically and economically important fish species. To better understand the dynamics of the changing HR-NYB ecosystem, an ecosystem model, coupling physical and biological processes, needs to be developed. Using the data collected in the Hudson River Biological Monitoring program and state and federal survey programs, we will identify key drivers and stressors that regulate the ecosystem dynamics. By coupling Object-oriented Simulator of Marine ecoSystem Exploitation (OSMOSE) with biogeochemical model NPZD and hydrological model Finite Volume Coastal Ocean Model (FVCOM), an end-to-end multispecies individual-based model will be built to model the trophic dynamics from plankton to top predators, within which the FVCOM-NPZD model describing the spatio-temporal dynamics of low trophic level (LTL) groups and the OSMOSE model describing the dynamics and interaction of high trophic level (HTL) species. The end-to-end ecosystem model can then be used to explore how long-term changes in key environmental variables may influence the HR-NYB ecosystem dynamics and provide critical information for supporting ecosystem-based fisheries management and marine conservation in the HR-NYB ecosystem.

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# Like Mother, like Daughter: Is there Evidence for Early Sexual Dimorphic Habitat Preferences in Blue Crabs?

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Blue crabs (*Callinectes sapidus*) exhibit a high degree of versatility within the Hudson River estuarine ecosystem as a predator, consumer, and prey throughout diverse habitats. Furthermore, they have maintained distinction as one of the only few remaining commercial fisheries in the Hudson River. Previous studies have shown that blue crabs exhibit salinity preferences - specifically mature females migrate into higher salinity regions after they have mated. We studied the juvenile blue crabs to see if similar preferences exist in younger populations. Since the 1980's, The New York State Department of Environmental Conservation's Hudson River Fisheries Unit has been conducting beach seine surveys targeting alosine species and striped bass. These surveys run from July through November from Hastings (river mile 22) to Albany (river mile 140). We used bycatch and salinity data from these surveys to examine preferences of the blue crabs throughout the estuary. The females have exhibited a clear preference to regions with higher salinity. As climate change threatens to move the salt front north it is important to better understand the implications that this might have on the dynamics of blue crabs throughout all of their life stages.

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**Assessing the Diet of Lake Trout in Seneca Lake, NY***

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The Lake Trout (*Salvelinus namaycus*h) population of Seneca Lake in Geneva, NY has failed to maintain long-term, stable recruitment levels and has been hatchery supported since the late 19th century. Local anglers have indicated that these fish are harder to find and catch in recent years. The purpose of this study was to analyze the health and diet of Lake Trout. The Lake Trout used for this study were collected at the annual Lake Trout Derby on Seneca Lake in May 2022. The stomach contents of each individual were dissected and analyzed. The length and weight of each fish was compared to the frequency of prey found in their stomachs, as well as the total biomass of digested organic material. The Fulton Condition Factor was used to compare the percent stomach fullness to the length of each fish. Adult Lake Trout appeared to be healthy in terms of size and weight. Larger Lake Trout tend to eat a higher frequency of prey items, and we found that their diet consists mainly of alewives. Future studies should be conducted on the younger Lake Trout population in the hopes of learning why these fish continue to struggle with successful recruitment.

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**Assessing Finger Lake Streams for Brook Trout Reintroduction Eligibility***

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Brook Trout are a native salmonid in eastern North America that were once abundant. Due to anthropogenic and natural changes in habitat, Brook Trout are no longer found in parts of their endemic range. Brook Trout require a specific range of water temperature, and habitat. This study aims to find suitable streams in the Finger Lakes region for Brook Trout reintroduction. Five sites were sampled: Buttermilk Creek, Filmore Glen, Fish Kill Creek, Taughannock Creek, and Reynolds Gully. Streams were sampled for fish community, benthic macroinvertebrate community, water quality, and habitat data. Reynolds Gully served as a reference site due to its current population of wild Brook Trout. Taughannock Creek, and Fish Kill Creek were deemed unfit for reintroduction. Taughannock Creek exhibited a non-suitable benthic macroinvertebrate community, low dissolved oxygen, high water temperature, and poor habitat. Fish Kill Creek has a large presence of competitive species. Buttermilk Creek and Filmore Glenn were deemed most suitable for reintroduction of Brook Trout due to abundant dissolved oxygen, diverse habitat, diverse benthic macroinvertebrate communities, and similar competition levels to the reference stream. A longer study period in the future would help better determine the suitability of these streams.

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**Exploring Habitat Use of Long Island's Artificial Reefs with Acoustic Telemetry***

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New York State established a series of 12 artificial reef zones along the south shore of Long Island as part of an integrated fisheries management approach. These zones vary from 3 to 850 acres, ranging from inside the bays to 14 miles offshore at depths from 15 to 143 feet. Since 2018, the state has more than doubled the artificial reef acreage within these zones by deploying vessels, railcars, steel turbines, and bridge structure material. While previous studies examined fish abundance on these reefs using visual or catch records to understand habitat usage, we deployed acoustic telemetry receivers at five of these reef sites in a fixed box pattern to determine fish movement across a range of temporal and spatial scales. Over three years, 1429 individuals were detected moving between the network of artificial reefs along the coast. The acoustic data from this project provide information on site fidelity and connectivity between these reef zones. Using these results, we plan to expand our arrays and create arrays at 10 reef regions to develop 3D movement models of habitat utilization. We envision that these studies will provide insight into how fish will respond to the presence of future offshore wind turbines.

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# Multi-Year Study Of Salt Marsh Nekton Composition Across Marshes At Different Stages Of Restoration*

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During the summer of 2021 and 2022, nekton surveys were conducted at four salt marsh sites in Suffolk County, NY to evaluate the efficacy of coastal resiliency restoration efforts. Marsh restoration aimed to facilitate increased water exchange throughout the marsh, giving fish better access to all areas of the marsh regardless of tidal stage.An indicator of restoration success is increased Mummichog (*Fundulus heteroclitus*) abundance. Fish and invertebrate abundance were measured monthly using minnow traps set overnight at sites with varying levels of restoration. Results from 2021 show a monthly change in nekton communities across all salt marsh sites, with overall increasing species richness as summer progressed, and a positive correlation between proportional abundance of mummichogs with restoration level. Trends significantly differed in 2022; species richness decreased as summer progressed and killifish abundance varied with month and restoration level. Larger quantities of other killifish species (Rainwater, Spotfin, Striped) and fewer invertebrates, eels and other juvenile fish were caught in 2022 compared to 2021. Changes in nekton composition may be the result of dryer marsh conditions and occurrences of extreme salinities (> 40ppt) due to less summer precipitation in 2022.

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**Acoustic telemetry validation of Atlantic Sturgeon dorsal scute microchemistry: complementary tools to reconstruct life-history of an endangered species***

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Sampling and microchemistry analysis of dorsal scute apical spines (DSAS) represents an innovative methodology to reconstruct past life-history events of endangered Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Here, we establish the broad potential of DSAS sampling for wild-caught Atlantic Sturgeon and demonstrate the congruence of age-estimates and trace-element ratio patterns obtained from these structures and pectoral fin spines (PFS). We also evaluate microchemistry signatures from both DSAS and PFS to infer past habitat use and age at initial entry into marine waters and, importantly, validate these interpretations using known-locations from acoustic telemetry detections. Major ontogenetic shifts in habitat use detected in the microchemistry signatures suggest our methodology appropriately identified the timing of initial juvenile migration into marine habitat, while providing information regarding the timing of transitions between freshwater and marine habitats that are essential to the management and conservation of this endangered species. Collection of DSAS samples is suggested to complement ongoing research efforts and provide additional data points beyond those available from conventional tag-recapture methods alone, allowing researchers and managers to resolve broad-scale details on movements and habitat use that occur prior to sampling encounters or outside of monitored areas.

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**Developing An Urban Glass Eel Recruitment Survey: Challenges And Lessons Learned***

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In New York, catadromous American eel (*Anguilla rostrata*) populations have been subject to pressure from increased urbanization and waterway infrastructure. While glass eel surveys have successfully improved scientific and public knowledge of these pressures along the Hudson River, surveys in Long Island have been lacking. In 2022, we developed a glass eel survey along the Peconic River from March-June. In Riverhead, NY in close proximity to industrial, commercial, and agricultural land, a culvert connected to a manmade stone pool provides a unique environment for glass eels to congregate in dense quantities as they make their way upstream. To measure daily trends in recruitment, we deployed a modified fyke net around the culvert opening for short sets (10-60min) and manually scooped with small nets for short periods of time (30-120sec) several times a week. The eels were counted and released above the dam. Daily recruitment rates were consistently high. However, sampling was made difficult due to the urbanized location, large tidal range, and spillway flow rate fluctuations into the pool. Though the eels can climb the stone wall to traverse the spillway and dam, low success rates likely cause a bottleneck in their journey upstream, warranting passage implementation at this site.

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# St. Lawrence River and Eastern Lake Ontario Walleye Tagging and Movement Study

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The recent innovations in acoustic telemetry have advanced our understanding of fish movements and habitat use. The U.S. Fish and Wildlife Service (USFWS) and the NYS Department of Environmental Conservation (NYSDEC) Region 6 are interested in furthering their understanding of the movement patterns of St. Lawrence River and Lake Ontario Walleye. This project is the first to be implemented as part of the broader St. Lawrence River Multispecies Telemetry Study. Beginning in 2021 the USFWS and NYSDEC deployed over 90 acoustic receivers establishing a telemetry array throughout the St. Lawrence River and are committed to maintaining the array annually for 10 years. The primary objectives of the Walleye movement study are to determine what stocks contribute to the St. Lawrence River population/fishery and how much mixing with Lake Ontario stock is present; as well as determine spawning location and site fidelity. Additional objectives of the study include identifying Walleye shoal spawning and characterize Walleye movements throughout the system. This presentation includes background of the St. Lawrence River Multispecies Telemetry Study and preliminary results for the Walleye tagging and movement study.

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# “In-seine” Fish Finds: Notable Encounters Beach Seining on the Hudson River

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The New York State Department of Environmental Conservation (NYSDEC) has conducted a striped bass (*Morone saxatilis*) young of year (YOY) beach seine survey in the Haverstraw and Tappan Zee regions of the Hudson River since the 1985 In addition to target species data, counts and measurements for non-target fish and invertebrates have been collected since the start of the survey. During the 2022 beach seine survey there were numerous encounters with rare species. For the first time in this survey’s 40-year history, a blackcheek tonguefish (*Symphurus plagiusa*) was caught in the Hudson at sites in the Tappan Zee region. Several other marine species uncommon to our survey were also caught in the brackish zone of the Hudson River estuary including cobia (*Rachycentron canadum*), sheepshead (*Archosargus probatocephalus*), and pigfish (*Orthopristis chrysoptera*). Environmental factors, including a higher recorded salinity at sampling sites during the 2022 field season may have contributed to these unusual catches. This poster presents an overview of interesting catches and general trends for non-target species throughout the four decades of this striped bass beach seine survey.

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# An analysis of the littoral fish communities of Brookwood Point and Rat Cove on Otsego Lake*

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Fish populations in Otsego Lake have been monitored with modified Pennsylvania trap nets for over 30 years. The time series of this survey spans several major ecological events in the history of Otsego Lake, including introductions of several invasive species (e.g., Alewife, Zebra and Quagga Mussels, Green Sunfish, and several invasive plants), as well as periodic stocking of piscivores to control invasive species (e.g., Lake Trout, Brown Trout, and Walleye). These ecological perturbations may have significantly affected native fish communities. The purpose of this study was to identify seasonal trends in species richness and annual trends in species diversity of Otsego Lake's littoral fish communities at the localities of Brookwood Point and Rat Cove, and to compare the littoral fish communities at these localities over time. The species richness of both localities generally peaks in July. The species diversity of both localities has increased since the start of walleye stocking in 2000 and remained relatively high and stable since the elimination of alewife in 2011. The littoral fish communities of Brookwood Point and Rat Cove have consistently become less similar over time. Further studies are needed to establish causal relationships for species richness trends and community overlap trends.

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# Advancing Brook Trout Spawning Surveys with Passive Acoustic Monitoring (PAM)

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For the past 25 years, the Adirondack Fishery Research Program has conducted spawning surveys to gain insight into the spawning phenology of Adirondack brook trout. These visual surveys have been used to identify the spawning period peak and quantify spawning effort (i.e., redd counts) on an annual basis. Remote locations, inclement weather, and shifts in spawning period have caused difficulties in conducting these surveys. In 2019, we introduced hydrophones into two of the surveyed lakes to listen to brook trout on spawning shoals.The goal is to evaluate the efficacy of passive acoustic monitoring to detect redd-digging activity and correlate it with the peak and duration of the brook trout spawning period in a particular lake. After four years of acoustic monitoring alongside visual surveys, we continue to investigate this method for reducing time and effort needed to gather important phenological data on Adirondack brook trout spawning.

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# Age structure and emigration of juvenile Hudson River Atlantic sturgeon

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The Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) is an anadromous fish that utilizes the Hudson River during its juvenile life stage for several years before emigrating to the Atlantic Ocean. The New York State Department of Environmental Conservation deploys gill nets in Haverstraw Bay, NY from late February through late April to monitor the juvenile Atlantic sturgeon population (2004-present). Since 2017, pectoral fin structures were removed from a subset of individuals and aged. A length-at-age key was then generated, and ages were assigned to all individuals across the entire time series. Seventy-seven percent of the sturgeon were 3 to 5 years old, while 15% were 6 years or older. The smaller proportion of older individuals suggests that emigration primarily occurs between years five and six. Individuals originally tagged in the Hudson River and recaptured in the Connecticut River supports this. Age specific indices of abundance were developed to better understand inter-annual age class structure. These data will help inform the age at which Atlantic sturgeon emigrate from their natal river and become susceptible to mortality along the Atlantic coast.

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# An Introduction to Historical Hudson River Biological Monitoring Program

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The Hudson River Biological Monitoring Program (HRBMP) started in the 1970s to address concerns about the Indian Point nuclear power plant impacts on fishes in the Hudson River, especially striped bass. Various sampling programs were developed in the HRBMP to cover spatiotemporal distribution of different life stages of striped bass and other fishes. In addition to abundance data and biological samples, water quality data were also collected from the river-wide Water Quality Survey. The HRBMP collected more than 150 fish species, over 1 million observations of survey data, and 13 million fish specimens from 1974 to 2019. The collected data and archived biological specimens from the HRBMP were donated to the Stony Brook University School of Marine and Atmospheric Sciences. The collection is currently managed by Dr. Yong Chen's Lab. The Chen Lab is developing research programs in collaboration with stakeholders to understand the impacts of climate and environmental changes and anthropogenic activities on the dynamics of Hudson River ecosystems and key fish populations. The Chen Lab is welcoming opportunities for collaborative research with partners who share similar interests in developing a better understanding of Hudson River dynamics and improved monitoring and management.

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# Uncoiling the Mysteries of American Eel (Anguilla rostrata) Emigration in the Delaware River

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The American Eel (*Anguilla rostrata*) is a catadromous fish that spends most of its life in river systems along the eastern seaboard from Venezuela to Greenland. Once mature; they transition to the silver life stage and leave freshwater river systems to spawn in the Sargasso Sea. Although the general pattern and timing of exit from freshwater is understood, detailed information of these movements is generally lacking. We have developed a collaborative project with the last remaining silver eel fishery in the longest undammed river on the US Atlantic Coast to explore the underlying environmental drivers mediating migration behavior using passive acoustic telemetry in the Delaware River. This effort will also provide managers with a baseline of timing, reasoning, and the characteristics of silver-phase American Eel emigration to guide strategic management in other modified river systems. The eels were collected in mainstem Delaware River commercial eel weirs as well as one located in the Neversink River, a tributary to the Delaware River. The passive acoustic receivers span the length of the non-tidal Delaware River to the mesohaline portions of the estuary. This project is ongoing; this poster will focus on emigration through the Delaware River system.

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# How Many Shortnose Sturgeon (*Acipenser brevirostrum*) are in the Hudson River?

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The last comprehensive population estimate for Shortnose Sturgeon (*Acipenser brevirostrum*) was conducted over 25 years ago. This endangered species has been listed since 1967. However, studies conducted in the 1970's and 1990's led some to believe the Hudson River is home to the largest Shortnose Sturgeon population in the world. This project implements new technology such as side-scan sonar and acoustic telemetry. The purpose of this study is to develop a technology-based mark-recapture method based on acoustic telemetry and side scan sonar to estimate population size of Shortnose Sturgeon in the Hudson River. In 2021-2022, 100 adult Shortnose Sturgeon were acoustically tagged, a river-wide array and overwintering area array were deployed, and side scan surveys were conducted. Our focal area resides in a known overwintering area in Esopus Meadows (RKM 135-144). These estimates will be combined with telemetry records to estimate the proportion of the population overwintering at this location and to extrapolate to a river-wide abundance estimate. These efforts will help improve our understanding of spawning periodicity, seasonal movement, and use of the river.

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# Investigation of Seasonal Cellular Parameters of Diploid and Triploid Eastern Oysters using Flow Cytometry*

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Triploid oysters are a popular aquaculture product as their associated sterility leads to enhanced free energy and improved growth rates. Although triploids represent a majority oyster product, little is known about how aspects of their biology (sterility, larger cells, increased energy reserves) influence immune parameters and metabolic activity. To address this gap in knowledge half-sibling triploid and diploid oysters were collected throughout their reproductive period and bled to assess cellular immune parameters. Using flow cytometry, reactive oxygen species (ROS), phagocytosis, cell viability, mitochondrial counts, and mitochondrial voltage were measured in hemolymph samples. ROS production and mitochondrial voltage were significantly higher in triploid granulocytes during the pre-spawn season. Phagocytic activity for hemocytes was significantly greater, in triploid when compared to diploid during the pre-spawn period. Phagocytic activity in triploid cells demonstrated little variability, whereas diploid hemocytes became more phagocytic as the reproductive season progressed eventually rising to triploid activity. Despite triploids typically having larger cell size than diploids, no significant difference was observed in the number of mitochondria per cell. Taken as a whole, differences in immune parameters and metabolic activities were most pronounced between triploid and diploid during the pre-spawn period, with convergence occurring during spawn, post-spawn, and recovery periods.

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**Comparison of DNA and bone reconstruction methods to analyze piscivorous Double-crested Cormorant diets within Lake Ontario-St Lawrence River***

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Impacts of piscivorous birds on fish populations have been closely studied in many aquatic systems, yet the impact of Double-crested Cormorants *Nannopterum auritus* twenty years following round goby *Neogobius melanostomus* introduction requires reassessment. Lake Ontario and the St. Lawrence River supports the largest cormorant colonies in New York State. As stressors continue to reshape aquatic food webs and some native fish populations decline, it is necessary to investigate potential causal relationships. The objective of this study is to analyze the diets of cormorants breeding within Lake Ontario and the St. Lawrence River systems, with a focus on current consumption of round goby. Today's diet reconstruction methods rely on bone identification from regurgitated pellets, this study aims to incorporate DNA methods to further analyze composition of cormorant diets. When analyzing cormorant diets through bone reconstruction, it is likely that small, young fish are underrepresented due to bone decomposition. Utilizing DNA analysis has the potential to increase the scope of identifiable fish species that cormorants are selecting while feeding. Updated diet analyses and annual monitoring of cormorant nesting sites is critical information for fishery managers to understand impacts to native populations.

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**Host fishes of the Yellow lampmussel***

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*Lampsilis cariosa* (Yellow lampmussel) is a freshwater mussel native to Atlantic slope drainages from New Brunswick to South Carolina. It is listed as Vulnerable by IUCN and is a New York State Species of Greatest Conservation Need. In comparison to other members of the genus *Lampsilis*, the Yellow lampmussel has not been well studied. Major components of its life history remain poorly defined. Previously, it was unknown which host fish species could be used to complete its parasitic life cycle. To confirm viable hosts, host fishes were inoculated with glochidia in the lab and allowed to transform into juvenile mussels. We confirmed previously undocumented hosts and gained insight for additional upcoming host fish trials. This research can help inform local regulation and inform managers how to best protect this species as well as aid in the propagation of Yellow lampmussel for restoration efforts.

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**Making sausage with countless cooks; combining genetic and acoustic telemetry data from many collaborators to understand coastwide migration patterns of Atlantic Sturgeon**

Matthew Breece, Dewayne Fox, David Kazyak, Matthew Balazik, Hal Brundage, Keith Dunton, Adam Fox, Mike Frisk, Christian Hager, Danielle Haulsee, Amanda Higgs, Eric Hilton, Joe Iafrates, Robin Johnson, Jason Kahn, Micah Kieffer, Michael Loeffler, Barbara Lubinski, Pat McGrath, Mike O'Brien, Ian Park, Bill Post, Eric Reyier, Tom Savoy, Dave Secor, James Sulikowski, Carter Watterson, Shannon White, Gayle Zydlewski

Following decades of intensive conservation efforts, many US Atlantic Sturgeon distinct population segments remain critically imperiled. Still experiencing the negative impacts brought on by historic overharvest and habitat loss, Atlantic Sturgeon are also being exposed to threats including marine construction, vessel strikes, and fisheries bycatch. Due to species' long lifespan and the tendency for adults and sub-adults to engage in coast-wide migrations, these threats are often realized over vast temporal and spatial scales that are difficult to monitor and even more difficult to mitigate. Moreover, interpopulation variation in spawning phenology likely results in substantial variation in the timing and magnitude of migration, which inhibits the transferability of individual studies across the species' range. Although many private, academic, state, and federal institutions have been independently conducting regional studies of Atlantic Sturgeon migration, integration of these efforts is needed to gain a more comprehensive understanding of continental scale habitat use. Working collaboratively with 14 institutions, we have compiled telemetry data (n= 32 million detections) and genotypes for 2650 telemetered Atlantic Sturgeon. We are using this dataset to characterize the migrations and habitat use of Atlantic Sturgeon across broad spatial scales. Genetic assignment tests will provide insight into when and where specific population segments occur, and in turn where they are exposed to threats, thereby improving our ability to mitigate potential damage. Results from this study will be used to identify important critical habitat areas and improve our ability to protect Atlantic Sturgeon during vulnerable life stages.

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**Comparison of normal and giant rainbow smelt using diet composition, growth, and otolith microelemental analysis***

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Rainbow smelt (*Osmerus mordax*) are an important native prey fish in Lake Champlain. Two size classes of rainbow smelt have been identified: normal (≤ 220 mm) and giant (> 220 mm). In 1856, giant smelt greater than 300 mm and over 225 g were common; some writers suggested these fish were anadromous. Our objective is to determine whether the two size morphs are the product of different habitat use, diets, or growth. We examined stomachs of 69 smelt and observed distinct diet preferences between normal and giant smelt. Normal smelt stomachs contained exclusively zooplankton while giant smelt contained exclusively fish. We used length-at-age analysis to compare growth rates between giant and normal size classes. We conducted otolith microelemental analysis to quantify element isotope ratios and determine whether the two morphs spent time in marine habitats or in different basins within Lake Champlain. Elemental ratios of smelt from landlocked and anadromous populations, Lake Ontario and Maine respectively, were used as standards for freshwater and marine signatures. Preliminary comparisons of Sr:Ca ratios indicated that Lake Champlain smelt only use freshwater environments; however, patterns for various elements differ between normal and giant smelt, suggesting they may have different basin occupancy within Lake Champlain.

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