-Abstracts-

58th Annual Meeting of the New York Chapter American Fisheries Society

February 6-8th, 2024
The Otesaga Resort Hotel
Cooperstown, NY

"Fisheries Management in an Ever-Changing Environment:

From Inlands to Oceans"

Plenary Presentations

Plenary Session (Ballroom 07, February 2024)

History of Lake Trout Management in Lake Champlain and Changes Following Recent Wild Recruitment

Margaret H. Murphy

Lake Champlain supported indigenous populations of Lake Trout *Salvelinus namaycush* during its early settlement. Lake Trout were rapidly depleted as development in the area progressed during the 1800s. Lake Trout stocking began in the late 1950s, producing a limited fishery. In 1973, the Vermont Fish and Wildlife Department, New York State Department of Environmental Conservation, and the U.S. Fish & Wildlife Service formed the Lake Champlain Fish and Wildlife Management Cooperative. A major goal of this cooperative is to develop and maintain a salmonid fishery focusing on restoration of landlocked Atlantic Salmon *Salmo salar* and Lake Trout. Fin clipped yearling Lake Trout have been stocked annually since the 1950s. The wild Lake Trout population is evaluated by examining the proportion of unclipped to clipped Lake Trout captured in fall sampling with a low percentage of unclipped fish captured through 2019. Starting in 2015, a high percentage of unclipped juvenile Lake Trout were collected during bottom trawl sampling by University of Vermont researchers. Gillnet sampling of subadults, starting in 2020, also has documented an increasing proportion of unclipped Lake Trout. We will review the data and management actions that have occurred since 2021 to maintain a healthy Lake Trout population.

Plenary Presentations

Freshwater mussel conservation: exploring population trends in Delaware River Tributaries

Andrew Gascho Landis

Despite adoption of watershed management practices and significant improvements to water quality over the past several decades, populations of freshwater mussels continue to decline. New York's approximately 50 species of freshwater mussels face a wide variety of ongoing threats. Understanding the link between specific threats and population declines is necessary for conservation action. We assessed trends in diversity and abundance in the East and West Branches of the Delaware River and the Neversink River. Over the past 30-years abundances in the Neversink River have remained relatively constant, while the diversity has decline substantially. Species with periodic life history strategies have suffered the most, while the equilibrium species has remained stable. To explore potential drivers of community change we surveyed mussel populations on a gradient downstream of the hypolimnetic release reservoirs on all three rivers. Stream temperatures at mussel sampling sites were modeled using data from the Northeast Stream Temperature Database. Mussel abundance and diversity increased as distance from the reservoir and temperatures increased in the Neversink and East Branch. No mussels were observed in the West Branch. Conserving freshwater mussel resources will require commitment to meeting their instream habitat needs by providing suitable flows and temperatures.

Plenary Presentations

Conservation and Management of Native Predatory Fishes within New York's Northern Connection to the Atlantic Ocean, the International St. Lawrence River

John M. Farrell

SUNY College of Environmental Science and Forestry

The St. Lawrence River is New York's northern connection to the Atlantic Ocean, and it provides immense services as it drains the Great Lakes and provides top-ranked fisheries. Its current situation creates a stay-awake-at-night example of the challenges of the competing effects of regulated hydrology, global shipping, invasion meltdown and world-class recreational fisheries. Its predatory fish are native and move through sensitive critical periods that revolve around repeated cycles within changing habitats to grow, reproduce, *and* sustain as they have for millennia. *Do they need our help?* This presentation looks at current St. Lawrence River fish population trends, research diversification, and advances to support an ongoing adaptive management process as a partnership between agencies, NGOs, a university with a small island field station, and river people. We will consider the life cycles, challenges, and future for St. Lawrence River predator fish as a dynamic process involving both natural and human induced effects.

Plenary Presentations

The Importance of "Polishing the Covenant Chain" to Fisheries Restoration

Tony David

Director, Environment Division, Saint Regis Mohawk Tribe

Fisheries managers and researchers may share considerable commonality with Tribal Nations whose culture and value systems are rooted in sustainable native species of flora and fauna. The habitats of native fish species in particular overlay tribal territories and aboriginal use areas with complex histories and treaties ratified by US Congress. Many agencies are required to consult with Tribal Nations on some level; however, protocols for consultation are varied—so too are the successes and setbacks. The development of inroads with Tribal Nations proceeds under the backdrop of US Indian Policy that targeted termination at all levels. In the modern context, successful engagement with Tribal Nations requires nuance and awareness of protocols for engagement that can lead to long-term partnerships. Forging these types of partnerships is part of our common history from colonial times, where the "covenant chain" or bonds of friendship are periodically polished and renewed. This presentation will summarize these obstacles and recent examples for how supporting Tribal self-governance can result in stronger, mutually beneficial resource management outcomes

Oral Presentations

Oral Presentations (*Student Presentations)

Species of Concern (Ballroom, 07 February 2024)

Rare Fishes and Inventory

Douglas M. Carlson

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The history of actions for conservation of rare fishes since the Federal Endangered Species Act and implementation of a New York State Endangered Species program fits into a 50-year time frame. The actions and achievements of these programs in New York need greater visibility, and this might lead to greater engagement by groups trying to find funding, developing plans and hiring researchers. A perspective will be offered how gains in the next several years will be more challenging and need to be accompanied by comprehensive sampling or inventory and combining record sources. There will be a discussion of how several of the declining species are simply not being adequately inventoried. Until the technology of environmental sampling (e-DNA) is answering these distributional questions, there needs to be more seining, habitat assessments and hard field work. Species used in these examples will include Longnose Sucker, Black Bullhead, Western Pirate Perch and leuciscids like Swallowtail Shiner. There will also be an overview of the progress in New York's recovery programs, some with gains and some apparently on pause.

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Population Ecology of the Threatened Mooneye

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Mooneye *(Hiodon tergisus)* is a rare fish found in the Oswegatchie River. It is classified as threatened in New York, and has experienced population declines and reductions in its range across New York in recent decades. The Oswegatchie River retains the largest known mooneye population in the state and provides an opportunity to collaborate and learn more about this understudied fish species. Using techniques such as electrofishing, gill netting, and citizen reports, we are estimating population size, habitat use, and seasonal behaviors of mooneye. Findings from this study will help us answer the question as to why the Oswegatchie River system is able to support a mooneye population unlike other rivers where the mooneye have disappeared. Results from the first of two seasons of research have indicated that the CPUE varies seasonally when electrofishing is used as the primary detection method. The decline in detectability over the summer months correlates with warming water temperatures, which could indicate that mooneye move to deeper waters, out of the effective range of the electrofishing boat. Ultimately, the information gained from this research will be used to help NYSDEC draft a conservation plan for this species in New York.

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

Kelsey Alvarez del Castillo*[1], John Maniscalco[2], Richard Pendleton[1,2], Eugene Won[3], Suresh Sethi[4] and Lars Rudstam[1]

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Round goby (*Neogobius melanostomus*) were introduced to the Great Lakes in the 1990s and were first documented in the Hudson River estuary in 2021. We assessed salinity tolerance of round goby through lab-based trials reflective of Hudson River watershed conditions to help inform the spread risk of this species. Study specimens were subjected to regular salinity increases of 3ppt per week, concluding at 33ppt. When held at an energetically optimal temperature of 20°C, there was 0% mortality up to 24ppt, which increased to 17.5% (27ppt), 78.5% (30ppt), and 100% (33ppt). The second trial consisted of tanks held at a 26°C and 5°C, representing temperature extremities expected in the Hudson River watershed. In warmer water (26°C), mortality occurred at a lower salinity than at 20°C, with 1% mortality at 21ppt, and increased to 12% (24ppt), 62% (27ppt), 93% (30ppt), and 100% (33ppt). In colder water (5°C), only 13% mortality occurred throughout the trial, while the remaining specimens persisted at the endpoint salinity of 33ppt. Combined with observations on experimental fish condition, results indicate that round goby may tolerate salinities consistent with a large portion of Hudson River estuary waters, however, this species may be unlikely to survive full strength marine salinities.

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The threat of Northern snakehead to New York waterbodies

Steven Pearson and Ashley Morris

New York State Department of Environmental Conservation

Aquatic invasive species present a threat to New York fish communities and habitats through predation and competition. The northern snakehead (*Channa argus*) 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. In November 2023, a temporary barrier was installed, and a permanent barrier is being considered. Continued surveying in the Delaware and Hudson Canal will be necessary to determine the barriers' efficacy. Additional studies on northern snakehead distribution, ecology and genetics are being planned.

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Snails behaving badly: an example of maladaptive behavioral responses to non-native predators

Chris Pennuto & Kira Yerofeev

Buffalo State University

Snails exhibit predation defenses ranging from morphological changes to behavioral responses when faced with native predators, and those responses are mediated by predator type. Previous work suggests they are particularly vulnerable to predation by non-native round goby in newly colonized habitats. We investigated the plasticity of behavioral responses by determining if predator foraging domain (pelagic or benthic) was as important as predator identity (native or non-native) or taxonomic group (fish vs crayfish) using kairomone trials in the lab and a field mesocosm experiment. In the lab, snails avoided different predator kairomones differently over 2-hours of exposure, though responses to conspecific alarm cues and fish were strongest and almost always crawl-out behavior. In the mesocosm, snails exhibited strong crawl-out responses to crayfish and had high survival whereas snails were eliminated by round gobies within 3 days of starting the experiment. These data suggest native physid snails employed some initial behavioral avoidance when exposed to kairomones of both native and non-native predators, but were too slow to respond to non-native round goby predation in outdoor mesocosms. Thus, native populations of physid snail would seem vulnerable to new introductions of round goby in tributary streams.

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Status of Round Goby in Eastern New York

Scott D. George[1], Barry P. Baldigo[1] and Richard Pendleton[2]

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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 widespread and increasing in density in the Mohawk River, patchy but in low abundance in the Hudson River estuary as far downstream as Newburgh, and present in the upper Hudson River-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. Anticipated efforts in 2024 include assessing ecological impacts, viral hemorrhagic septicemia (VHS) testing, analyzing experimental salinity trial data, diet metabarcoding, pedigree analysis, and monitoring for further expansion towards Lake Champlain via the Champlain Canal and Richelieu River.

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Scanning the Horizon for Future Aquatic Invasive Species Concerns

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U.S. Fish and Wildlife Service

Horizon scanning for previously unrecognized potential new invasive species, and the resulting species watch lists, are foundational to a proactive approach to invasive species management. In 2019, the U.S. Fish and Wildlife Service (USFWS) initiated regional horizon scanning efforts to identify fresh- or brackish water species at risk of arriving and establishing populations via unintentional or unassisted movement. This process uses regional priorities to identify focal taxa and pathways for each scan and is designed to be repeatable over time as priorities change. The resulting watch lists can help inform regulatory decision-making, improve training resources, and refine detection tools and strategies. Our process is designed to complement other horizon scanning efforts to achieve a more complete picture of new invasive species risks to the United States. Three USFWS scans have covered areas of New York with a fourth planned to start in spring 2024. Prioritized pathways included movement of water-based recreational and commercial equipment, release of live bait, and dispersal through hydrologic connections. To date, the efforts have identified 21 fish, 9 plant, and 7 invertebrate species that may be of concern to New York in the future.

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eDNA Metabarcoding as an AIS Detection Tool on a Great Lakes Invasion Front

Jacob Cochran[1], Aaron Maloy[2] and Jason Coombs[2]

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The Great Lakes invasion front of Tench (*Tinca tinca*), a non-native fish species, is currently below the last upstream barriers to Lake Ontario in the St. Lawerence River. Early detection monitoring efforts using traditional fisheries methods have successfully captured Tench below these barriers. However, with binational interest focused on monitoring for Tench upstream, molecular detection methods are also being employed. Here, we used metabarcoding, a multi-taxa environmental DNA (eDNA) method, to identify fish species DNA found in water samples. Samples were collected in 2022 and 2023 within known Tench areas below the barriers, and in waters above the barriers where Tench have not yet been observed. Results showed that metabarcoding detected Tench DNA below the barriers where individuals have previously been captured, supporting its use as an early detection tool for this species. There were also DNA detections within the Wiley-Dondero Canal indicating Tench may be using the canal for upstream passage. Beyond monitoring for Tench, eDNA metabarcoding detected 70% of the fish assemblage as described by traditional gears and accounted for 17 unique species. The capability of metabarcoding to monitor an AIS invasion front and provide a general fish community assessment show expanding utility of this developing molecular tool.

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Oral Presentations

Oral Presentations (*Student Presentations)

Monitoring & Detection (Iroquois, 07 February 2024)

Utilizing all the tools in the toolbox: An adaptive approach to Early Detection and Monitoring using environmental DNA (eDNA) metabarcoding

Colleen Keefer, Aaron Maloy and Jason Coombs

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Prevention and early detection are key to the management of aquatic invasive species (AIS) in the Great Lakes. Broad-spectrum AIS surveillance efforts typically target all life-stages of fish, increasing detection probabilities. However, taxonomic identification of ichthyoplankton is difficult and time consuming. With advancements in environmental DNA (eDNA), monitoring programs have access to new methods of detection and taxa identification. Here, we utilized eDNA methods, like metabarcoding, for identification of ichthyoplankton and adult fish. Beginning in 2017, the Lower Great Lakes Fish and Wildlife Conservation office compared morphological and genetic larval fish identifications. Results spurred further questions on how genetic methods could be utilized for larval fish and greater fish community assessments. In 2022, sampling was conducted to compare eDNA metabarcoding between water samples and ethanol decants from ichthyoplankton pushnets and traditional adult fisheries gears. In total traditional gears detected 28 species, decants 26 species, and water samples 38 species. Results found that ethanol decants and water samples had a 67% similarity rate in species detected, while water samples and traditional gear were 57% similar. Incorporating new and expanding genetic technologies, like metabarcoding, into our surveillance efforts increases our chances of detecting novel AIS and provides more information on fish communities.

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Use of Environmental DNA to assess American Eel populations in the Mohawk-Hudson river system

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United States Geological Survey

Recent attempts to characterize the status of American Eel in the Mohawk River watershed have been ineffective, and it was unclear to what extent a series of locks and dams around the confluence of the Mohawk and Hudson rivers limit access to upstream reaches of the watershed. We developed a model between environmental DNA (eDNA) quantity and eel abundance in Hudson River tributaries in which the DNA concentration in water samples explained up to 65% of the variability in eel density and 56% of the variability in eel biomass. We then used this model to interpret eDNA data collected twice from 36 sites across the Mohawk River watershed in 2021. American Eel DNA was detected almost exclusively in the downstream-most 4 km of the Mohawk River and the concentration of DNA was reduced by approximately 80% across each successive upstream barrier. Our data suggest population density was high in the Hudson River estuary, declined rapidly in the lower Mohawk River, and was negligible or undetectable upstream of the Crescent Dam and the Waterford Flight of Locks. Thus, barriers appear to be largely restricting American Eel from using >99% of the Mohawk River watershed.

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A survey of American eel within fish communities of the Upper Susquehanna Watershed

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American eel (*Anguilla rostrata*) are an important predator within freshwater systems. They were previously common in the Upper Susquehanna River watershed, but populations have declined in recent decades. This decrease in abundance has been primarily caused by the presence of dams within the watershed. SUNY Oneonta, the Susquehanna River Basin Commission (SRBC), and other organizations have collaborated to ascertain the presence of American eels and determine their distribution within the upper Susquehanna River and its tributaries. This was accomplished using standardized electrofishing surveys for the physical collection of fish and eDNA sample collection to detect American eel DNA present at sites. The goal of this ongoing study is to improve the understanding of American eel distribution within New York so they may be managed effectively and there is a greater understanding of how to detect them. A graduate student from SUNY Oneonta conducted electrofishing surveys to characterize all fish species at nineteen sites in the upper Susquehanna River watershed, as well as eDNA sampling for American eels at each site, in July 2023. We have preliminary fish counts from backpack electrofishing surveys, but we do not yet have eDNA analysis results. One American eel was detected through backpack electrofishing.

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Lake Trout Status in Lake Erie

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New York State Department of Environmental Conservation

Lake trout (*Salvelinus namaycush*) were extirpated from Lake Erie around 1965 and concerted restoration efforts began in 1982. However, lake trout survival to maturity was low until sea lamprey control was initiated in 1986. In the 35 years that followed, lake trout survival improved and an adult population developed, yet no natural recruitment was detected. Between 2021–2023, a total of eight lake trout fry were captured in fry traps from several sites along Shorehaven Reef, NY, representing the first evidence of successful natural reproduction since lake trout extirpation. Trapping locations were selected using results from a VEMCO Positioning System (VPS) acoustic telemetry array in November 2019, visual observations of lake trout displaying spawning behavior in November 2020, and habitat assessment using underwater cameras to visually inspect and determine potential spawning locations. Trapping efforts will shift in 2024 to sample additional potential spawning locations. Lake trout aggregations and potential spawning locations have also been documented in Ohio and Pennsylvania. These findings signify a major step forward for lake trout rehabilitation efforts in Lake Erie, confirming that successful reproduction is possible with wild lake trout surviving to the post-embryo stage and that continuing rehabilitation efforts by Lake Erie management agencies are warranted.

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Improving Our Understanding of Great Lakes Reef Habitats for Lake Trout & Coregonines: Three Case Studies Using a Multibeam Echosounder

Josephine R. Johnson[1], Dimitry Gorsky[1], Brian Weidel[2], Alexander Gatch[2], James Markham[3], Jason Robinson[3], Collin Farrell[1], Kyle Morton[1], Ryan Walquist[2], Samantha Lasalle[2], Lucas Le Tarte[2], Georgia Hoffman[2], Matthew Nguyen[2], Christopher Legard[3], Gian Dodici[1] and Pascal Wilkins[3]

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Despite decades of effort to restore Lake Trout (*Salvelinus namaycush*) and coregonines, wild populations of these fishes remain low in the lower Great Lakes. Several hypotheses exist for why natural recruitment remains low, but physical changes in spawning habitat affecting early life survival seems promising. However, addressing habitats effect on early life survival requires the development of methodology to quantify changes in habitat at scales appropriate to detect factors affecting ecological processes. We conducted habitat assessments at spawning reefs in lakes Ontario and Erie using a multibeam echosounder to collect high resolution (10-25 cm) bathymetry and backscatter data coupled with underwater video footage for ground-truthing. Specifically, in three case studies we: 1) Evaluated habitat change through time from a given location and identified potential sites for restoration; 2) Installed a new reef with clean substrate and measured infilling the following year; and 3) Characterized a reef where lake trout egg deposition has been observed, and created an underwater wayfinding system to facilitate field logistics in future studies. We were able to successfully replicate the same substrate data acquisition methods at different site locations. Our methodology streamlines assessments on the relationship between physical structure and biological responses in Great Lakes reefs.

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Coregonine egg deposition and larval emergence following spawning substrate additions in Chaumont Bay, Lake Ontario

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U.S. Geological Survey

Description Coregonine (Cisco and Lake Whitefish) populations in Lake Ontario have remained low relative to historic abundance, following centuries of anthropogenic stressors. The availability of quality spawning habitat is hypothesized to limit populations, however supporting evidence is limited. Cobble substrate (median diameter = 160mm) was added to Chaumont Bay, Lake Ontario in 2022 on a known spawning site at four different depths (2 – 5m) to experimentally test how depth and availability of substrate interstices mediate coregonine reproductive success, with added substrate expected to increase coregonine egg deposition and larval emergence. Two years of monitoring winter egg deposition and spring larval emergence revealed greater larval emergence over new substrate relative to control sites despite lower egg deposition on new substrate the first year, and similar egg deposition relative to control sites the following year. This suggests that adults may initially avoid added substrate the first year and that net effects of added substrate on coregonine production may require multiple years of monitoring efforts to capture. Additionally, greater larval emergence over new substrate suggests these additions provide higher quality egg incubation conditions (i.e., clean interstices) than predominant embayment substrates (i.e., mussel shell hash, silt, and bedrock) and may improve coregonine reproductive success.

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Modelling regional space use of fishes using acoustic telemetry

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Acoustic telemetry is a common tool used in fisheries management to estimate fish space use from a local habitat scale to entire systems. Numerous analytical models have been developed to estimate different aspects of fish movement from telemetry datasets, yet evaluations of model performance and comparisons among models are limited. Here, we demonstrate a framework for evaluating model estimates of regional space use in large and fragmented systems using an acoustic receiver array in Lake Champlain. Our framework simulated the tracks of 100 acoustically tagged fish using a random walk and created detection events based on receiver positions and distance-based detection probability. Regional space use for the simulated data was then estimated by six movement models that ranged in analytical complexity, and results were compared to the true distributions of space use for each simulated track to evaluate model error. Five criteria were established to compare model performance and select the optimal analysis. Outputs from our simulated data and model selection showed significant differences in model performance among the six movement models based on model error. These results demonstrate potential for substantial variability in interpretation of acoustic telemetry data for describing regional fish distribution dependent on the analytical method used.

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Quantifying benthic-pelagic flux of Mysis biomass through diel vertical migration on a lakewide scale: A Lake Ontario case study

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Mysis is a macroinvertebrate that couples benthic and pelagic habitats on a daily timescale through diel vertical migration (DVM). However, quantifying how much biomass is exchanged between these habitats on a lakewide scale is difficult because of sampling limitations and variability in DVM behavior related to light and depth. Although *Mysis* are benthic-pelagic migrators, a portion remains pelagic during the day offshore in Lake Ontario, contradicting the assumption of population-level DVM over deep areas. To estimate the amount of biomass transferred from benthic to pelagic habitat via DVM on a lakewide scale, we estimated the portion of pelagic biomass at night originating from benthic habitat as the difference between night and day pelagic estimates from net tows along a depth gradient. Next, we modeled the portion as a function of depth. Finally, we extrapolated estimates to an existing lakewide night-pelagic dataset and summed amounts across depth strata. Results suggest that despite greater offshore (>180m) night-pelagic densities, more biomass was transferred from benthic to pelagic habitat at intermediate lake depths (80-180m). We discuss next steps to improve estimates of *Mysis* habitat coupling and important factors such as depth and light for modeling *Mysis* DVM behavior at the population- and ecosystem-levels.

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Oral Presentations

Oral Presentations (*Student Presentations)

Spawning: The Next Generation (Kingfisher Tower, 07 February 2024)

Tails from the Past: Uncovering Forgotten Lake Sturgeon Spawning Areas in the New York Waters of Lake Erie Using newspaper archives

Collin Farrell, Josephine R. Johnson, Kyle Morton and Dimitry Gorsky

U.S. Fish and Wildlife Service

Lake Erie was likely once home to the largest population of Lake Sturgeon *Acipenser fulvescens* in the world. At the peak of the commercial fishery in Lake Erie in 1885, over 2,300 metric tons of Lake Sturgeon were harvested, >78% of which occurred in New York waters. Overfishing and habitat degradation led to the subsequent collapse of this fishery by the 1920s, and historic spawning locations of Lake Sturgeon are poorly understood. The Buffalo Harbor area is the only known location where Lake Sturgeon spawning occurs in these waters today. In this talk, we will present information gathered from newspaper archives indicating other potential Lake Sturgeon spawning areas in the New York waters of Lake Erie, including possible shoal spawning sites. These potential shoal spawning sites could help inform Lake Sturgeon rehabilitation efforts in this region.

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Estimating Spawning Population Abundance of Lake Sturgeon on Artificial Spawning Beds

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The Lake Sturgeon (*Acipenser fulvescens*) is a North American temperate freshwater fish that is listed as a threatened species in New York State. The Lake Sturgeon population in the St. Lawrence River has been drastically reduced, largely due to overfishing, the establishment of dams, and spawning habitat loss or degradation. The New York Power Authority created artificial spawning habitats for Lake Sturgeon in 2007 upstream and downstream of the Iroquois Dam. The New York State Department of Environmental Conservation (NYSDEC) has monitored spawning sturgeon at these sites since 2011 using transect-based underwater video. We estimated local abundance of Lake Sturgeon on these spawning beds from 2011-2022 using spatially explicit n-mixture models that accounted for imperfect detection of individuals and autocorrelation among observed counts. Detection of individuals was generally highest during the peak of the spawning season. Abundance was highest over spawning beds and was generally higher at the downstream bed than at the upstream bed. We observed interannual fluctuations in abundance at both beds that were potentially indicative of recruitment and/or spawning periodicity. Abundance decreased slightly at both beds during the monitoring period. Additional monitoring of this population could improve understanding of periodicity and long-term trends.

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Characterization of low-frequency sounds associated with an Atlantic sturgeon spawning aggregation in the Hudson River

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Recent work has suggested that sound production is likely widespread among ray-finned fishes, but acoustic characterizations are lacking for most species, limiting our ability to monitor fish populations using passive acoustic survey methods. Identification of species-specific acoustic cues typically involves either focal recordings, or the combination of passive acoustic data with other sampling modalities capable of supplying insights into species presence. To date no studies have reported sound production in endangered Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), a species of management and conservation concern, but several other species of sturgeon are known to produce sounds. In the Hudson River, gill net and telemetry data have identified the primary Atlantic sturgeon spawning aggregation near Staatsburg, NY. We analyzed acoustic data recorded at this site and others and identified low-frequency rumbles similar to the "thunder" reported for spawning lake sturgeon. These sounds were present exclusively at the spawning site. This may suggest that Atlantic sturgeon communicate acoustically during spawning, and that these cues may be used to non-invasively detect their presence using passive acoustic monitoring methods. Next steps will be to correlate number of rumbles with number of unique telemetry tags per unit time and obtain focal recordings of captive Atlantic sturgeon.

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A tough egg to crack: Sources of embryonic mortality in Cisco (*Coregonus artedi*) from a Lake Ontario population

Alex Gatch, Marc Chalupnicki, Gregg Mackey, Megan Lambie and Brian Weidel

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Centuries of anthropogenic stressors to the terrestrial and aquatic landscape have led to the infilling and degradation of high-quality rocky substrates necessary for lithophilic spawning fishes of the Great Lakes (e.g., Cisco, *Coregonus artedi*). Coupled with climatic changes (e.g., variability in protective ice cover/duration), degraded rocky substrates may not support successful embryonic incubation. In a controlled environment, we quantified the effect of mechanical shock (wave action), incubation substrate, and water temperature on the survival of Cisco embryos. Embryos were exposed to 1-hour simulated storm events in flume tanks with substrates containing high and low interstices at intervals from fertilization to eye-up. Additional Cisco embryos were incubated in static chambers ranging from 0.5-3.0°C in silt, dreissenid hash, and control substrates from fertilization to eye-up. Results indicate that embryos are susceptible to mortality from mechanical shock (sheering of the chorion) at all developmental intervals. However, substrates with greater interstitial spaces can significantly mitigate shock-induced-mortality. Embryos incubating in suboptimal substrates (silt, hash) have significantly reduced survival compared to controls, regardless of incubation temperature; likely due to chemical imbalances (i.e., anoxia). Results add to the growing evidence that degraded incubation substrates and changing environmental conditions may limit recruitment of Cisco in Lake Ontario.

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Using Substrate Imagery to Evaluate Lake Trout Spawning Habitat in Lake Ontario

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Since their extirpation in the 1950s, the management goal for restoring Lake Trout (*Salvelinus namaycush*) in Lake Ontario is the recovery of a naturally reproducing population. One of the hypothesized impediments to this goal is the degradation of viable spawning habitat. Lake Trout typically spawn on rocky substrates between 5-15m in depth. This habitat is being lost because of sedimentation from anthropogenic changes to the Lake Ontario watershed, as well as the abundance of invasive dreissenid mussels. In 2023, the Cooperative Science Monitoring Initiative (CSMI) of Lake Ontario began a lake-wide substrate imagery survey of potential Lake Trout spawning habitats. The goal of this survey is to visualize the quality and quantity of Lake Trout spawning habitat across Lake Ontario. Sampling occurred between September and November of 2023, with additional sampling planned for spring and fall of 2024. This international collaborative effort has yielded 5,500+ videos of Lake Ontario substrates, providing habitat information that was previously unavailable. Preliminary data indicates a lack of quality substrates, particularly at depths greater than 10 meters. This substrate imagery survey is the first step towards a larger effort to restore Lake Trout spawning habitat in Lake Ontario.

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Host Fishes of the Yellow Lampmussel: Using Fish Traits to Predict Their Effectiveness

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Despite the critical role in the life cycle of freshwater mussels, half of North America's species lack information on their host fish requirements. The yellow lampmussel (*Lampsilis cariosa*) has limited investigation of its host use. Yellow lampmussel are native to the Atlantic Slope drainages of North America from New Brunswick to Georgia and is declining across its range. We tested 23 potential host species in the lab by infesting them with yellow lampmussel glochidium larvae. Using metamorphosis rate of glochidia to juveniles, we assessed the effectiveness of the potential hosts. We used generalized linear models in R to assess multiple host fish attributes to understand and predict their possible influence on metamorphosis. Smallmouth bass (*Micropterus dolomieu*), walleye (*Sander vitreus*), black crappie (*Pomoxis nigromaculatus*), and brook trout (*Salvelinus fontinalis*) were the most effective hosts in our study with metamorphosis rates ranging from 6% - 55%. Our models showed host species were the best predictor of effectiveness, followed by host fish native to the Atlantic Slope. These newly added hosts will help maximize conservation aquaculture production of yellow lampmussel for the purposes of reintroduction. Additionally, host fish populations can be managed to maximize conservation of yellow lampmussel.

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Bayesian Mark-Recovery Modeling Improves Estimation of Young-of-year Northern Pike Survival in St. Lawrence River Coastal Wetlands

Thornton Ritz* & Dr. John Farrell

SUNY - Environmental Science and Forestry

Estimating survival of young-of-year (YOY) fish is difficult due to high mortality and the challenge in capturing small elusive individuals in a complex habitat. Historically, St. Lawrence River surveys have captured YOY Northern Pike (*Esox lucius*) emigrating from wetlands following early development. As an r-selected species with low survival, estimation of early YOY Northern Pike survival can be difficult using traditional statistical methods. Mark-recovery models incorporating Bayesian inference have been used to estimate probability of survival and recovery of marked individuals and could help overcome challenges in estimating YOY survival. To test this, we released 48,047 Northern Pike swim-up larvae (fry) marked with oxytetracycline (OTC) across 16 sites while simultaneously monitoring dissolved oxygen and water temperature. Northern Pike YOY were then captured over an 18-day period, and their otoliths were extracted and viewed for the OTC mark. Using catch data, we fit a mark-recovery model with a multinomial likelihood to estimate survival probability. From our posterior distribution, we estimated the probability of recovery to be 0.027 and the probability of survival to be 0.025. Bayesian analysis proved useful in estimating the true survival probability of YOY Northern Pike and allowed for an informed assessment on this critical early life stage.

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Inferring Brook Trout Spawning Phenology Using Passive Acoustic Monitoring

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For 25 years, the Adirondack Fishery Research Program has investigated brook trout spawning phenology using visual redd counts. These annual surveys have provided information on spawning shoal locations, the timing of spawning activity, and the intensity of the spawning effort. However, the efficacy of these visual surveys is influenced by inclement weather, potential shifts in spawning phenology, and infrequent visits to survey locations. Beginning in 2019, we began testing the utility of hydrophones as a method of detecting spawning activity throughout the duration of a spawning season. We compared traditional visual redd counts to the frequency and timing of redd digging activity recorded using three different types of hydrophones. We also evaluated the ability of machine learning software to detect targeted sounds and process thousands of data-dense audio files. Our results suggest that passive acoustic monitoring improves upon the results of visual surveys as a means of gathering high-resolution phenological data on brook trout spawning activities, but also poses a new set of challenges in terms of equipment cost and durability, deployment logistics, and information processing.

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Oral Presentations

Oral Presentations (*Student Presentations)

Fisheries & Ecosystem Management (Ballroom, 08 February 2024)

Comparing Lake Sturgeon Size at Age Across Water Bodies in NYS

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Lake sturgeon (A*cipenser fulvescens*) is a large, long-lived, native fish residing in water bodies throughout the Great Lakes watershed. Once considered a nuisance fish and harvested for their caviar, they are currently listed as a threatened species in New York. We compared sturgeon lengths between restoration populations in Oneida Lake and Genesee River, New York with the extant population in the Niagara River, at ages 6 and 9 using ANOVA and Tukey tests. Lake sturgeon from the Niagara River and Oneida Lake populations were ~241-312 ($F_{2,213}$ = 278.78, $p < 0.05$) and ~313-334 ($F_{2,97}$ = 114.18, $p < 0.05$) millimeters larger than similar age fish from the Genesee River. Sturgeon in the Oneida Lake population were 71 mm larger at age 6 than sturgeon in the Niagara River population, but sturgeon in both populations were similar at age 9. Understanding the variation among populations will help inform the development of population-specific expectations, especially for populations being actively restored. Moving forward, we will work on developing location specific age-length keys for New York waters, comparing size at age with additional Great Lakes sturgeon populations, and attempt to identify factors that contribute to variation among populations.

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Fish Biodiversity and Ecosystem Services of Cranberry Lake, New York

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Cranberry Lake is the third-largest lake in the Adirondack Mountains, and is a popular site for angling and recreation. The lake's fish community has experienced major changes due to the introduction of predatory species such as black bass (*Micropterus salmoides* and *M. dolomieu*) in the 1960s and northern pike (*Esox lucius*) in the 1990s. We conducted biological surveys to assess the current composition of the fish community, as well as angler surveys on their priorities and the lake's ecosystem services. The NYSDEC have detected 30 species in Cranberry Lake dating back to the 1930s, but we only recorded 11 during our surveys, and did not detect many of the native minnow species once present in the lake. Despite the lake's reduced biodiversity, anglers expressed the high value that they placed on it for recreation and for fishing as a way that they spent time with their families. Many expressed the lake's importance as a place they had been visiting for many decades. While less disturbed lakes with high biodiversity are often conservation priorities, Cranberry Lake demonstrates that sites with reduced species richness still can provide important ecosystem services to local communities.

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Post-stocking Mortality and Behavior of Age-1 Lake Trout in Lake Ontario

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Survival of age-1 hatchery raised Lake Trout (*Salvelinus namaycush*) is important to the efficacy of stocking Lake Trout to manage the adult spawning population in Lake Ontario. Wild-produced Lake Trout comprise less than 10% of the adult catch and has been near the detection limit since the beginning of focused rehabilitation efforts in the 1970s. Until impediments to early life survival of wild produced offspring are remediated, the adult population must be maintained through efficient hatchery supplementation. In spring 2023, a passive acoustic telemetry receiver grid array was deployed in Lake Ontario; it covered approximately 250 km^2 of water and ranged from 5 to 150 meters of depth. Acoustic transmitters with predation sensors were surgically implanted into 129 yearling Lake Trout prior to stocking in May 2023. Of the 129 Lake Trout, there were at least 17 mortalities with only two documented predation events occurring over 60 days post-stocking. Fish movement behavior was variable when stocked at different depths. This project will help to improve survival and lead to a better understanding of age-1 Lake Trout space use, ultimately aiding to the restoration of a self-sustaining population.

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Trophic ecology of burbot varies among basins of Lake Champlain

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Burbot (*Lota lota*) serve important roles as a flexible, generalist predator in coldwater food webs. In Lake Champlain, burbot are found throughout the Main Lake and Inland Sea basins, which differ in prey availability, oxythermal habitat, and ecosystem productivity. We examined differences in trophic ecology of burbot from the two basins using diet and stable isotope analysis. Age and diet composition were estimated for over 130 burbot, and ratios of stable carbon and nitrogen isotopes were analyzed for a subset of these fish. Burbot in the Main Lake attained a greater length-at-age and consumed fish more commonly than burbot in the Inland Sea. We quantified the baseline-corrected trophic level (an indicator of food chain length) for burbot collected in the two basins. We also used stable isotope mixing models to compare burbot reliance on benthic *vs.* pelagic resources in distinct basins. Our results highlight the ecological flexibility of burbot across a range of environmental contexts and food web structures, which may become increasingly important to the species' persistence through climate change.

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Implementing a new NY Statewide fish advisory – using angler input and audience testing to update and improve communication materials

Audrey Van Genechten

NYS Department of Health

NYS Department of Health (DOH) has been issuing fish advisory information for over 40 years. In recent years, NYS DOH has made an effort to update the health protective guidelines used to set fish advisories. Using a comprehensive analysis of statewide mercury data has led to significant changes to the statewide general advisory. This new advisory is considerably more complicated while being health protective. DOH's Outreach and Education group has used its experience with audience testing to better understand angler needs and preferences to inform the creation of new outreach materials for anglers. The presentation will include:

An overview of how DOH works with DEC and how DOH sets advisories.

Describe the three-year process to apply new mercury guidelines across NYS.

Describe some of the work DOH had done with newcomer and lower literacy audiences

Share results of a survey sent out to NYS licensed anglers regarding preferences

And describe how DOH took into account these preferences when finalizing the statewide advisory and embarking on new communication materials.

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The Transformative Impact of Online Reporting and Workflow Automation on Marine Fisheries Data Management

Megan Barrow

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In the ever-changing environment of fisheries management, the integration of online reporting systems and the adoption of innovative workflow automation tools has revolutionized data collection, analysis, and decision-making processes. This presentation digs into the transformative impact of online reporting mechanisms and software solutions on marine fisheries data management practices, highlighting their efficiency in enhancing accuracy, timeliness, sustainability, and accessibility of crucial fisheries data. By utilizing online workflows, organizations have reduced reliance on paper-based processes, thus expediting quality control mechanisms and allowing professionals to allocate more time and expertise towards data analysis, interpretation, and strategic decision-making. As we navigate the complexities of the digital age, understanding the nuances, challenges, and opportunities presented by online reporting and workflow automations is paramount for shaping a resilient and adaptive future for marine fisheries data management.

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Oral Presentations

Oral Presentations (*Student Presentations)

You Are What You Eat (Ballroom, 08 February 2024)

Use of Stomach Contents, Fatty acids, and Stable Isotopes to Assess Lake Trout Diet from Otsego Lake

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The diet of Lake Trout from Otsego Lake, NY has varied amidst a history of non-native species introductions. Despite their short residency in Otsego Lake (c.1986-2012), Alewife became the main component of Lake Trout diet. However, since their extirpation, the diet of Lake Trout remains largely unknown. The objective of this study was to determine the current diet of Lake Trout using stomach content (SCA), fatty acid (FAA), and stable isotope (SIA) analyses. Adult Lake Trout were collected during the falls of 2021 and 2022, while potential prey were captured seasonally from 2021 to 2023. SCA indicates that Lake Trout diet was composed primarily of Chironomids (57.1%, frequency of occurrence), Dreissenids (28.6%), Slimy Sculpin (22.9%), and Lake Trout eggs (20.0%). FAA showed Slimy Sculpin, Bluegill, Dreissenids, and Rainbow Smelt as likely prey, whereas SIA revealed Rainbow Smelt, Slimy Sculpin, and Dreissenids as dominant prey. The results of these analyses suggest a return to Slimy Sculpin as the dominant prey of Lake Trout in the absence of Alewife and provides an overdue update on the current diet of lake trout for the future management of this popular keystone sportfish in Otsego Lake.

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Using a Pangenome Graph to Explore Genomic Variation Related to Thiamine Metabolism in Lake Charr (*Salvelinus namaycush*)

Christopher A. Osborne*[1,2], Dr. Dan MacGuigan[1], Dr. Nathan Backenstose[1], Dr. Jacques Rinchard[3], Dr. Brian Lantry[4], Dr. Dimitry Gorsky[2] and Dr. Trevor Krabbenhoft[1]

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Thiamine deficiency complex (TDC), a nutritional disorder caused by insufficient thiamine (vitamin B1), has been linked to recruitment failure in several salmonids and is associated with the consumption of Alewife and Rainbow Smelt. While TDC has been shown to affect multiple salmonids, there appears to be considerable variation in susceptibility to this disorder, both between species and between populations of the same species. For example, populations of Lake Charr from the Finger Lakes appear to be capable of producing viable offspring with egg thiamine concentrations low enough to induce offspring mortality in other populations, which suggests that there may be some variation in genetic predisposition to TDC in this species. To identify genomic variation putatively related to differential thiamine metabolism in Lake Charr, we are constructing a pangenome using 30 *de novo* genome assemblies of Lake Charr from populations varying in their history of exposure to Alewife and Rainbow Smelt. This pangenome will allow us to comprehensively identify genetic variants ranging from single nucleotide differences to mutations millions of bases in length. This could provide insight into a genomic basis for the differential thiamine metabolism observed among Lake Charr populations and could aid future restoration efforts.

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Density, prey, temperature, and time: Which factors are most related to Walleye condition, growth, and length?

L. Zoe Almeida, Anthony J. VanDeValk, Thomas E. Brooking, Nicole Saavedra, Cameron Davis and Lars G. Rudstam

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In exploited populations, management actions that affect density can alleviate, intensify, or obscure the effects of other environmental variables. We attempted to tease apart the effects of density-dependent and -independent factors on body condition (relative weight, Wr), young adult growth (ages 4-6), and age-6 length using data from Oneida Lake Walleye across 45+ years between 1968-2022. We evaluated generalized additive models (GAMs) with model selection that included combinations of adult population size, prey biomass, per-capita prey biomass, cumulative degree days during growing season (CDD), and year, with population and per-capita prey representing density-dependent variables. The best models (ΔAICc < 2.0) for Wr (R^2 = 0.25, R^2 = 0.25, R^2 = 0.25) and growth (R^2 = 0.30) all included density-dependent variables, whereas the best models for age-6 length (R^2 = 0.73) did not. The strength and direction of density-dependent effects on Wr and growth was non-linear and changed overtime. Interestingly, CDD was included in the best model for age-6 length but was not for those of Wr and growth. Overall, management actions aimed at decreasing populations to increase condition and growth may only be effective in some situations depending on prey and population size, but adult length may be unaffected.

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Are fish what they eat? Gut microbiome patterns of fish from the Upper St. Lawrence River.

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Coined as the “second brain” an organism’s gut microbiome influences its health, physiology, development, and behavior. I present our group’s research investigating factors that contribute to the development and composition of gut microbial communities of fish from the Upper St. Lawrence River. While abundant microbes in the water column do not mirror fish gut communities, specific microbial constituents are habitat associated. Not surprisingly overall gut bacterial communities are more similar between phylogenetically closer species. Moreover, shared microbial constituents (regardless of habitat or host species factors) support the existence of a “core microbiome” suggesting a conserved and potential functional relationship. Furthermore, field studies suggest that gut bacterial community patterns can be explained, at least partially, by a fish’s trophic guild. While aquaria experiments demonstrate the strong influence initial diet has on a fish’s gut microbiome. Our studies and others suggest that availability and selection of prey, and factors that influence this, play a significant role in host gut microbial community patterns. Therefore, changes to an organism’s diet, whether in or beyond the individual’s control, may significantly affect its gut microbial community and function(s) at the individual and community levels.

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Oral Presentations

Oral Presentations (*Student Presentations)

Hudson River Biological & Ecosystem Monitoring Program (Iroquois, 08 February 2024)

Advancing a next generation Hudson River Ecosystem Monitoring Program

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Examining fish and wildlife populations, along with the broader ecosystem, is crucial for guiding effective conservation management practices. The Hudson River has benefited from comprehensive monitoring of its fish populations since the early 1970s, notably through the Hudson River Biological Monitoring Program. This program was funded by utility companies that operated on the Hudson River and the program concluded in 2020 following the release of the final utility company from its original commitments. This pause in data collection provides a unique opportunity for the development of a new monitoring framework that not only builds upon the four-decade legacy of the previous program but also incorporates new technologies and synthesis of existing data. This transition prompts a reevaluation of the primary outcomes prioritized in fisheries and ecosystem monitoring. This presentation provides an overview of the conclusion of the historic Hudson River Biological Monitoring Program. It discusses ongoing efforts to refine the program, aiming to transform it into the next-generation Hudson River Ecosystem Management Program. The evolution seeks to leverage the extensive experience gained over the past 40 years while integrating technological advancements to enhance the effectiveness and scope of ecosystem monitoring beyond that of fishery management.

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Historical Hudson River Biological Monitoring Program: Challenge and Opportunity

Yong Chen[1], Gregg Kenney[2], Richard Pendleton[2] and Jim Lodge[3]

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The Hudson River Biological Monitoring Program (HRBMP), covering the Hudson River from the Battery to Albany, was initialized in 1974 to evaluate the impacts of Hudson River water users OR power generators on fish community and environments in the Hudson River estuary. The long-term database provides a unique opportunity to address many scientific and management questions about the dynamics of fish community and populations in a changing Hudson River ecosystem. However, the data and samples are relatively unknown and have not been utilized in its full capacity. In this talk, I will review the HRBMP and discuss some of the challenges and opportunities in using the HRBMP information. I will also discuss lessons learned in developing a monitoring program that can be effectively used to address key and pressing scientific and management questions.

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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 and Yong Chen

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Comprehensive metadata records are crucial to understanding and using data from long-term monitoring programs. The Hudson River Biological Monitoring Program (HRBMP) is a long-term survey program covering the Hudson River from the Battery to Albany and was conducted from 1974-2017 through six core surveys. Although these surveys follow statistical design principles, many technical/procedural changes occurred to address issues such as modified survey goals. Due to survey design changes, complex data structure, and lack of publicly available information, the research potential of the HRBMP has been limited. Therefore, having improved information for potential users is critical to the full realization of the HRBMP potential. An interactive and phased approach was implemented to develop metadata for the HRBMP data. Potential metadata models were evaluated and a model that balanced the needs of users and complexity of the metadata structure was selected. We consulted with stakeholders before finalizing the HRBMP metadata. The metadata documents are publicly available online to facilitate data sharing. Metadata can help users better understand the HRBMP database, increase the utilization of HRBMP data, and promote collaborations to address scientific and management questions critical to the Hudson River. This framework can be adapted for other long-term monitoring programs.

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Conservations have improved heavy metal contaminations in Hudson River Striped Bass

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Heavy metals, originating from various sources, threaten aquatic ecosystems and human health. New York has been progressing in various areas, encompassing the environment, finances, and societal aspects, and the Hudson River Estuary (HRE) plays a crucial role in facilitating those developments. While developments came with pollution and other issues that negatively affect human health and burden the aquatic environment, changes have been made through robust management efforts, regulatory measures, and ecosystem restoration initiatives. This study investigates heavy metal concentrations in Striped Bass (*Morone saxatilis*) in the HRE. We utilized archived Striped Bass scales from the Hudson River Biological Monitoring Program to assess water quality over three periods (1989, 2003, 2017). Twenty-seven heavy metals were analyzed, with cadmium, mercury, lead, and vanadium highlighted for detailed investigation. Statistical analyses reveal significant temporal changes, with concentrations decreasing over the years. The observable decrease in heavy metal concentrations in Striped Bass scales is a proxy for positive trends in environmental health, affirming the achievement of pollution control measures in the region. This study provides insights into the environmental dynamics of the HRE and underscores the resounding success of strategic pollution mitigation strategies. Continued research and monitoring remain critical.

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Spatiotemporal dynamics of suitable spawning and habitat for bay anchovy (*Anchoa mitchilli*) in a changing Hudson River Estuary

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Bay anchovy (*Anchoa mitchilli*) is a small coastal species common along the Atlantic coast, with the Hudson River Estuary (HRE) as the northernmost extent of its range. The HRE is a partially mixed tidal estuary stretching 245 kilometers from New York City to Albany and provides critical habitat for bay anchovy. Bay anchovy is an essential component of the HRE food web, acting as prey for economically valuable species. Suitable spawning grounds, critical to bay anchovy recruitment and the broader HRE ecosystem have not been evaluated. Environmental variables such as temperature, conductivity, depth, and dissolved oxygen may influence the distribution and abundance of bay anchovy. In this study, egg abundance and water quality data from the long-term Hudson River Biological Monitoring Program (HRBMP) from 1982 to 2017 are used to address the following two objectives: understand changes in abundance and distribution of bay anchovy eggs over time and identify key environmental variables influencing spawning habitat use and distribution within the HRE. This study can provide critical information on possible movements or adaptations of bay anchovy in a changing HRE, leading to improved understanding of climate change impacts on forage fish.

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Understanding the dynamics of white perch spawning habitat in the Hudson River using long-term ichthyoplankton monitoring data

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Aquatic ecosystems are undergoing unprecedented changes, which are likely to alter critical habitat for fish. As ecosystems change, understanding the consequences for fish population dynamics and habitat use is essential for their management. The Hudson River Estuary is one such ecosystem undergoing environmental change. Using white perch (*Morone americana*) survey data on early life stages collected during the Long River Survey as part of the Hudson River Biological Monitoring Program (HRBMP), we evaluated the drivers of changes in egg abundance and spawning habitat since 1980. Results indicated that egg abundance is associated nonlinearly with habitat characteristics, space, and time. Additionally, large changes in hotspots of spawning activity within the Hudson River Estuary were identified. Notably, we also found that egg abundance has declined within the estuary over time. This study further revealed that the lower extent of spawning habitat has moved upriver since 1980. This study indicates that the dynamics of white perch in their early life histories and their spawning habitat are changing. It also highlights the utility of a long-term monitoring program for broadening our understanding of fish ecology in the age of big data in changing ecosystems.

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Shifting spawning phenology in the Hudson River American shad

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Changes in seasonal life history events, referred to as phenology, are widely recognized as a common response of organisms to ongoing environmental changes. It is crucial to comprehend these shifts in organisms' phenology because they can have far-reaching effects on population dynamics and demography. Diadromous species hold significant ecological and economic importance, yet many North American diadromous species are currently in critical endangerment, with some populations already lost. While various hypotheses have been proposed to explain their declines or extinctions, the impact of climate change on their spawning phenology remains insufficiently studied. This study suggests that water temperature may serve as a crucial trigger for initiating spawning in Hudson River American shad. Moreover, the findings indicate that the timing of spawning peaks and cessations has been progressively delayed over time, and this is linked to the size of female spawners. The insights obtained from this study, concerning both biotic and abiotic factors influencing Hudson River American shad spawning phenology, provide valuable information for improving our understanding of adaptive response of American shad in the face of climate change, leading to improved management and conservation of diadromous fish populations.

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Rise of the machines: leveraging side scan sonar and machine learning to enumerate sturgeon in a large river system

Adam Bonemery, Amanda Higgs, Richard Pendleton, Dewayne Fox, John Madsen, David Kazyak, Shannon White, Patrick Sullivan, Amanda Simmonds and Tomasz Smolinski

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Estimating demographic parameters for sturgeon populations remains a fundamental management objective that is often difficult to meet given species' life history and their spatiotemporal scales of habitat use. Newer technologies and methodologies are available to provide enhanced population estimates, including the integration of side-scan sonar and acoustic telemetry with machine learning to provide robust estimates of population size. The large amounts of data collected using side-scan and telemetry makes image and data processing cumbersome, inhibiting their application to sturgeon conservation. Here, we demonstrate using Python programming and machine learning programs to generate and process side-scan sonar imagery. Applying these methods to two on-going projects in the Hudson River, we show how these techniques can improve the speed and reliability of using side-scan sonar imagery to monitor demographic trends in sturgeon populations. As our methods use open-source technologies and simple computer programming, they are poised to improve the efficacy of side-scan sonar for the monitoring of wild sturgeons.

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Calibrating the historical Long River Survey Data in the Hudson River Estuary to account for effects of changing sampling protocols

Ming Sun, Hsiao-Yun Chang, Katrina Rokosz and Yong Chen

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Fish abundance indices are instrumental indicators of population dynamics, commonly obtained from fishery-independent surveys following consistent statistical designs. Modifications to survey protocols often result in bias in fish abundance data, necessitating calibration to remove unrelated variability when modeling abundance indices. The Long River Survey (LRS), part of the historical Hudson River Biological Monitoring Program (HRBMP), was conducted from 1974 to 2017 and spanned the Hudson River Estuary, providing valuable ichthyoplankton data. However, the LRS experienced changes in sampling protocol, including inconsistencies in timing, location, and gear types, posing challenges in interpreting and comparing fish abundance trends over space and time. To mitigate the sampling effects in data and calculate the unbiased fish abundance trend, we performed data calibration based on suitable statistical modeling frameworks (Generalized Additive Models) for representative species of various life stages. Model validation showed consistent calibration performance across varying time series lengths. The findings demonstrated the impact of sampling protocol changes on abundance estimates, underscoring the role of model-based approaches in data calibration and providing insights for future survey design.

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Oral Presentations

Oral Presentations (*Student Presentations)

The Past, Present & Future (Kingfisher Tower, 08 February 2024)

Past vs. present: A survey of the tributaries of Oneida Lake, New York

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In 1932, Van Cleave and Mueller conducted a study on the parasite fauna of the fish in Oneida Lake and its tributaries, where they made many discoveries. Since 1932, the lake has undergone many environmental changes which have impacted the parasite fauna. The surveys conducted by Dr. Reyda and his students in recent years mostly included the lake with one tributary, Chittenango creek. The data from these surveys suggest evidence of extirpation of certain parasite species. For example, the trematode *Rhipidocotyle papillosa,* was found only in the tributaries in a sample of only four Smallmouth bass. This trematode uses a native clam as its first intermediate host, which is believed to have been displaced from the lake and moved into the tributary due to invasive mussel species. Fish were collected via backpack shocking, full necropsy of fish to collect parasites, the mounting of parasites for identification using light and scanning microscopes. Through an extensive survey of the fish parasites in Oneida Lake's tributaries, I will compare my results to Van Cleave and Mueller's study and determine whether the fish parasite species in the tributaries are different than those found in the lake.

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A Survey of Freshwater Fish Parasites from the Everglades, FL

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A survey of intestinal parasites of freshwater fish was conducted across sites in the eastern portion of the Everglades, Florida from May to August 2023. Fish were collected through various sampling means in conjunction with a collaborator in Florida, intestines were examined for all fish and a subset received full necropsy. Seven hundred and fifteen fish from 31 species were investigated from 13 sites across STA-3/4, WCA-3A, WCA-3B, Lake Okeechobee, and surrounding water bodies. Parasite identification is ongoing, but, of the parasites observed, more immature worms were found than adult worms. Parasites found included acanthocephalans, trematodes, nematodes, cestodes, arthropods, and mollusks. One new host record for an acanthocephalan, *Octospiniferoides chandleri*, was documented in *Labidesthes vanhyningi*. *Astronotus ocellatus* had four new host records. From *Micropterus* sp., a potentially new species of acanthocephalan and a poorly-known previously described species were documented. Three non-native species of parasites were documented, including one from *Mayaheros uropthalmus*. The aim of this survey was to compare results to a classical parasite survey done in the area by Bangham in the late 1930's. Fifteen of Bangham's original 45 species of fish were investigated in this study, reflecting the extensive environmental change in the habitat since the original study.

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Assessing the Restoration Potential of Brook Trout in the Water Being Returned to the Onondaga Nation

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Brook trout (*Salvelinus fontinalis*) are part of the Onondaga Nation's vision for the biological and cultural restoration of approximately one thousand acres of land and water being returned to the Nation under the Onondaga Lake Natural Resource Damage Assessment and Restoration Program. The SUNY ESF Center for Native Peoples and the Environment (CNPE) are aiding this vision by assessing brook trout health in Onondaga Creek under a shared research partnership with the Nation. The near century-long solution salt mining and stocking of non-native brown trout has limited brook trout distribution in numerous ways. We aim to further understand the ecological factors that influence brook trout distribution in Onondaga Creek. We conducted fish, aquatic macroinvertebrate, water quality, and environmental DNA sampling in 2023. Our findings suggest that brook trout seek refuge in the spring-fed tributaries of Onondaga Creek, where decreased stream connectivity may be causing isolation. Collaborative efforts between the Nation and CNPE are working with state and federal managers to assess the restoration potential of brook trout in Onondaga Creek as part of a larger vision of Indigenous-led stewardship.

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Reconstructing half a century of lake whitefish and cisco recruitment dynamics across the Great Lakes

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Lake whitefish (*Coregonus clupeaformis*) and cisco (*C. artedi*) are socioecologically important fishes across the Laurentian Great Lakes; however, many populations of both species have experienced sporadic or declining recruitment in recent decades. Generating comparable year-class strength (YCS) indices among lakes and species shows strong promise for improving understanding of the processes driving recruitment variability across biophysical gradients and life-histories. We integrated 38 long-term surveys of lake whitefish and cisco catch and age data across each of the Great Lakes and Lake Simcoe. This combined time-series spans 1960–2019 and represents the most comprehensive dataset compiled for analyzing Great Lakes coregonine recruitment to date. We estimated lake whitefish and cisco YCS in each lake using longitudinal mixed effects regressions of relative cohort abundance through time. We subsequently quantified spatiotemporal synchrony in YCS among lakes using correlation and dynamic factor analyses. Generally, lake whitefish YCS was positively synchronized among lakes and has declined from a period of elevated YCS during the 1980s-1990s, whereas cisco YCS was sporadic, varied around the long-term mean relative to each lake, and was largely asynchronous among lakes. Ongoing work is using these standardized YCS estimates to investigate underlying biophysical drivers of cross-species, cross-basin recruitment variability.

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Navigating native cisco (*Coregonus artedi*) restoration in Keuka Lake, New York

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In recent years, coregonine (*Coregonus* spp.) restoration has been attempted by fishery managers to improve forage resources throughout the Great Lakes basin. Cisco (*C. artedi*) were historically a major component of the native prey fish assemblage; however, their populations have sharply declined due to a combination of habitat degradation and competition from introduced fishes. Here, we applied acoustic telemetry and environmental DNA (eDNA) to evaluate the fate of juvenile cisco reintroduced to Keuka Lake, where they were previously extirpated. To date, over 450,000 juvenile cisco have been stocked by NYSDEC since 2018. We successfully demonstrated that small (< 1.0g) tags coupled with a whole-lake array yields estimates of juvenile fish survival useful for future stocking practices. Additionally, eDNA surveys revealed that cisco show spatial preference within Keuka Lake, yet accurate inference of their distribution also required information from telemetry and lake current measurements. Combined, estimates of survival, abundance, and the distribution of stocked cisco will be used to develop population projections and a lake ecosystem model for Keuka Lake. This research demonstrates that acoustic telemetry and eDNA technologies provide opportunities for managers to improve the conservation of fisheries in Keuka Lake and inland lakes elsewhere across New York State.

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A mixed-stock analysis of lake trout recovery in Lake Champlain

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The population of lake trout (*Salvelinus namaycush*) in Lake Champlain has seen a robust and sustained recovery since wild-spawned juveniles were first observed in 2015. Although welcome, the burgeoning stock of wild recruits has raised questions about how best to manage a fishery that was previously sustained entirely by annual stocking, with managers concerned about the possibility of exceeding the available prey base. These concerns have led the regional management cooperative to precautionarily cut stocking rates by 50%, which includes the complete cessation of stocking by New York State. To evaluate the effects of these changes on abundance and inform future management actions, we estimated the current state of Lake Champlain's mixed-stock population using a combination of long-term catch datasets, archived tissue samples, and next-generation genetic tools. Here we report results from that effort which include stocking-source-specific survival rates, a virtual population analysis of the individual stocked components, and close-kin mark-recapture modeling of the adult population contributing to wild recruitment.

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Climate Weirding Effects on Adirondack Fishes

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Since the 1970s, SUNY ESF undergraduate and graduate students in Fisheries Science class have sampled fish communities in the five lakes at the Huntington Wildlife Forest (HWF), ESF's research property in the Upper Hudson Watershed in Essex County. Without a formal monitoring program, these constitute the only long-term observations, paired at times with tandem studies in Limnology class. Sampling standardized on trap-netting allowed us to make limited long-term comparisons. Since 2008, counts of dominant Brown Bullhead in Arbutus Lake declined from thousands to hundreds to less than a dozen, and in 2016 and several years thereafter, zero fish were recorded in trap-nets there. Fish counts hit a minimum in other sampled Huntington lakes in 2016, and simultaneously a bloom of an exotic freshwater hydrozoan (*Craspedacusta sowerbii*) was discovered in Wolf Lake. Ice-free status of the HWF lakes hit a maximum in winter 2015-16; general warming trends continue and deoxygenation is evident. Although recovery has occurred in Wolf and Arbutus lakes, Deer Lake was invaded by warmwater *Micropterus* spp. and subsequently has a greatly reduced food web. We hypothesize fish declines and community shifts observed at HWF were triggered by climate-related, deoxygenation events as well as gradual warming.

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Revision of species status for the Summer Sucker and implications for New York State species delineation

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The end goal of species delineation is to establish the taxonomic status of a taxonomically uncertain biological unit, but along the way, new biological and ecological mechanisms are discovered that are often more interesting than the ultimate species status. This is true for Summer Suckers, a taxonomically very uncertain biological unit with 6 reclassifications since its discovery in 1886. Summer Suckers are an extremely small (up to 100 times smaller in mass) and late spawning morph of the White Sucker and are restricted to headwaters in the Adirondack region. We used whole genome sequencing combined with robust field sampling to determine that Summer Suckers do not represent their own species. More interestingly, the Summer Sucker is an extreme life history strategy of White Suckers that has convergently evolved at least twice and only in the Adirondack region despite the White Sucker's massive range across North America. With this understanding, we draw comparisons between the evolutionarily significant unit (ESU) framework developed for Pacific Salmon, and New York State's species definition to question whether the Summer Sucker could be considered a protected species.

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Re-imagining the landscape for river herring restoration through coastwide population models

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River herring, Alewife *Alosa pseudoharengus* and Blueback Herring *A. Aestivalis* collectively, were historically among the most abundant and economically valuable fish on the east coast of the USA. Abundances have demonstrated coherent declines range-wide due to overfishing, pollution, and habitat loss. Dams blocking access to habitat, along with marine bycatch, are posited to be among the primary drivers of their failure to recover. We created habitat-based population models to connect marine and freshwater life history processes in a comprehensive stock assessment tool that allows exploration of the relative impacts of access to spawning and rearing habitat alongside other important drivers such as in-river harvest or marine bycatch. We applied these models at the coast-wide level to understand how habitat access has influenced abundance and to what degree abundance could be increased through fish passage or dam removal. The results show that about 75% of Alewife habitat and 30% of Blueback Herring habitat in freshwater systems is currently located above at least one dam. Current estimates of fish passage through dams suggest that fish passage currently fails to achieve substantial population recovery. However, improved passage through dams or dam removal has significant potential to increase coast-wide abundance.

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Should we encourage Blueback Herring to use the Mohawk River?

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This presentation explores the potential benefits and challenges of encouraging Blueback Herring to use the Mohawk River as spawning and nursery habitat. Integrating field measurements with life-history-based simulation models, the study assesses the impact of increased access to the Mohawk River on Blueback Herring populations. The talk covers Hudson and Mohawk River geographies, the Cohoes Falls, and the canal system's role, highlighting the species' long-distance spawning movements. Life-history-based simulation models suggest potential benefits if dam and lock passage mortality is sufficiently low. However, actual mortality rates remain unknown. A field investigation planned for 2024, involving the tagging of Blueback Herring with 135 acoustic tags, aims to determine mortality rates and answer crucial questions about access to the Mohawk River. An existing acoustic array, and 2024 expansion, will consist of ~90 receivers and provide coverage throughout the mainstem of the Hudson River and part of the Mohawk River. Detection data will inform migration patterns and mortality rates. The study emphasizes the complex management challenges posed by dams and locks, acknowledging potential threats while recognizing the opportunity to enhance conservation efforts for this valuable species. The results aim to inform decisions on managing the Mohawk River and Erie Canal system for the benefit of Blueback Herring populations.

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Poster Presentations

Poster Abstracts (*Student Presenter)

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

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Comprehensive metadata records are crucial to understanding and using data from long-term monitoring programs. The Hudson River Biological Monitoring Program (HRBMP) is a long-term survey program covering the Hudson River from the Battery to Albany and was conducted from 1974-2017 through six core surveys. Although these surveys follow statistical design principles, many technical/procedural changes occurred to address issues such as modified survey goals. Due to survey design changes, complex data structure, and lack of publicly available information, the research potential of the HRBMP has been limited. Therefore, having improved information for potential users is critical to the full realization of the HRBMP potential. An interactive and phased approach was implemented to develop metadata for the HRBMP data. Potential metadata models were evaluated and a model that balanced the needs of users and complexity of the metadata structure was selected. We consulted with stakeholders before finalizing the HRBMP metadata. The metadata documents are publicly available online to facilitate data sharing. Metadata can help users better understand the HRBMP database, increase the utilization of HRBMP data, and promote collaborations to address scientific and management questions critical to the Hudson River. This framework can be adapted for other long-term monitoring programs.

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Changes in the vertical structure of Lake Champlain zooplankton after the invasions of Spiny Waterflea and Fishhook Waterflea

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It is well documented that zooplankton exhibit diel vertical migration (DVM), moving higher in the water column at night and residing deeper during the day. Herbivorous zooplankton are thought to perform DVM as a strategy of visual predation avoidance, sacrificing growth and foraging opportunities by avoiding food-rich illuminated waters in the daytime to reduce predator detection rates. Two invasive predatory Cladocerans, spiny waterflea (*Bythotrephes longimanus*) and fishhook waterflea (*Cercopagis pengoi*) have invaded Lake Champlain in the past decade where both species rapidly reached high abundances during their invasion years (2014 and 2018 respectively). Spiny waterflea abundance declined in 2016 whereas fishhook waterflea abundance has remained high. As visual predators of herbivorous zooplankton, these invaders may have influenced the zooplankton diel vertical community structure in Lake Champlain, which could have cascading effects on the lake food web. Daytime and nighttime samples were taken in 2013, 2014, 2015, 2016, 2019, and 2023 at 5-meter depth intervals at a 50-meter deep site in Lake Champlain using closing plankton nets to determine the vertical structure of the zooplankton community before and after the invasive species introductions. The results show changes in the diel vertical assemblages of several native zooplankton taxa associated with invasion years.

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Identifying historically collected larval coregonines to species using a redesigned genetic assay

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Native coregonines are integral planktivores in the Great Lakes, contributing significantly to the lakes ecosystem's stability and resilience. Cisco (*Coregonus artedi*) and Lake Whitefish (*Coregonus clupeaformis*) once abundant in the Great Lakes, faced population declines in the 1900s due to overfishing and competition with non-native fishes. In the context of ongoing restoration efforts, identifying larval coregonine species is vital for better understanding the factors that affect recruitment. However, phenotypic variation makes it difficult to visually differentiate the species at the larval stage. To address this impediment, a Polymerase Chain Reaction Restriction Fragment Length Polymorphism assay that identifies each species was developed in 2018. Analyzing historical samples collected in Chaumont Bay, Lake Ontario, results indicated low amplification success with the original assay (24% ± 25%). We developed a new assay at a smaller locus (202 base pairs) that greatly increased amplification success (76% ± 24%) and species identification accuracy. The redesigned assay will enable the evaluation of a multi-decade larval coregonine time series to better understand the climatic-related factors affecting coregonine population dynamics and to enhance the restoration efforts of these imperiled species.

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Relatively precise but how accurate? Feasibility of using pectoral fin structures to age a long-lived species

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Shortnose Sturgeon (*Acipenser brevirostrum*) is an amphidromous fish that utilizes the entirety of the tidal Hudson River throughout its life history. The New York State Department of Environmental Conservation deploys gill nets throughout the tidal Hudson River for various Sturgeon monitoring efforts. Since 2017, pectoral fin structures have been removed from a subset of Shortnose Sturgeon and aged. Our objective was to assess the precision and accuracy of the primary pectoral spine (n = 85) and secondary pectoral ray (n = 84) for estimating the age of adult Shortnose Sturgeon. Pectoral rays had a higher agreement percentage (38.1%) compared to pectoral spines (30.6%), yet the coefficient of variation was higher in pectoral rays (7.82%) compared to pectoral spines (5.81%). Even though the coefficient of variation was relatively low, the accuracy of the age estimates is questionable. A known adult (538 mm FL) originally captured in 2004 was at large for 17 years before recapture. Only 16 annuli were visible on the pectoral spine and 11 on the pectoral ray, suggesting pectoral fin structures may greatly underestimate age for a long-lived species like Shortnose Sturgeon.

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Assessment of Walleye (*Sander vitreus*) Spawning Habitat in the Upper St. Lawrence River

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Walleye (*Sander vitreus*) are a popular sportfish in the Laurentian Great Lakes that has experienced a resurgence in Lake Ontario and the St. Lawrence River following a near extirpation in the 1970s. Despite the increasing population trend, there are no known Walleye spawning tributaries of the Thousand Islands region of the upper St. Lawrence River. Recent surveys conducted by the U.S. Fish and Wildlife Service (FWS) indicated no current use of area tributaries by Walleye despite evidence of favorable substrate and habitat characteristics in several streams. Quantitative evaluation of regional Walleye spawning habitat is needed to guide protection and restoration of habitat in tributaries throughout the region to sustain populations. To accomplish this, habitat assessment of stream bed characteristics will be compared among known spawning (reference) sites and restoration candidate sites. Additionally, Walleye egg implantation into the substrates at candidate sites will be used to test their ability to retain and support early life stages (eggs to free-swimming larvae) as a first step in understanding their suitability for restoration.

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Differences in cortisol concentration by deepwater cisco under stressful stimuli and during transportation

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Cortisol is a stress indicating steroid hormone commonly used in behavioral studies. Stressful stimuli increase cortisol levels in fish, allowing scientist to quantify stress responses caused by changes in the environment. Measuring stress responses in fish allows conservation hatcheries to develop best practices for handling and transporting fish. Restoration of Coregonus sp. is a management objective in Lake Ontario, but stressful delivery systems can impede successful stocking. We used an enzyme linked immunosorbent assay to measure cortisol concentrations in the blood plasma and skin mucus of Coregonus hoyi (bloater) cultured at the USGS Tunison Lab of Aquatic Sciences. C. hoyi were exposed to a stress stimulus or were transported from the hatchery in a simulated 2-hour stocking event. ANOVA indicated that transport time significantly affected cortisol concentrations ($P < 0.001$), with baseline concentrations (hour 0) being significantly lower than transport hours one or two (Tukey's HSD; $P < 0.001$ for both). Cortisol concentrations did not differ between transport hours one or two (Tukey's HSD; $P = 0.23$). Blood plasma provided more consistent measurements compared to mucus. This experiment acts as a pilot to further evaluate cortisol produced in fish during stocking of Coregonus sp.

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Assessment of the Impact of Weather on Walleye Population in the Black River, New York

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Artificial flow regulations affect native lotic fish communities. The Black River is a dammed tributary of Lake Ontario that supports a walleye (Sander vitreus) spawning population in its lowest reaches. The USGS monitored fish spawning in the lower river for thirteen years. However, ecological changes in the river affect fish conservation and a new spawning reef was constructed to enhance spawning and recruitment. Three areas on the Black River were monitored during the spawning period each year to compare spawning activity and larval production among remediated and non-remediated sites. Egg traps and Ichthyoplankton nets were used to collect larvae and eggs. Eggs and larvae were preserved in ethanol until they were identified and counted for each sample in the laboratory. Boxplots of these data compare walleye spawning activity across each section of the river. The ANOVA followed by HSD ($n=534$, $F=3.15$, $p<0.01$) showed greater spawning during week 7 (and possibly week 5) than in other weeks of the spawning season. No significant variation in egg deposition was detected among river sections. No increased egg production was detected on the artificial bed, but we document temporal changes of egg productivity and walleye spawning in the Black River.

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Bigeye Chub, four years as a priority species in DEC's Rare Fish Conservation Program

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Conservation of rare fishes is often complicated by limited knowledge about their current status, the degree of range loss and critical life history elements, and Bigeye Chub, Hybopsis amblops, of western New York provides a modern-day example. It lives in the larger and medium sized streams, is native to only 35 streams in 4 watersheds and has been recommended to be classified as Threatened. From surveys in 2019-23, it was shown to be locally abundant in Cayuga Creek near Cheektowaga and Stillwater Creek near Jamestown, and associated habitats were described. Other species in these areas with mild current have included Rosyface Shiner and Northern Hog Sucker. It has declined from a major part of its range and requires special efforts in sampling. This was one of several Federal Aid programs to further the knowledge about Species of Greatest Conservation Need. There needs to be more funding, a conservation plan and further studies of critical habitats.

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A Pilot Study to Evaluate Efficacy of Videographic Monitoring System for Nekton in Gansevoort Habitat Enhancement Project

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The once dominant eastern oyster (*Crassostrea virginica*) reefs of the lower Hudson River were nearly extirpated due to human activities, including over harvesting and pollution. Complex biogenic habitats like oyster reefs have been widely shown to enhance local biodiversity, increase fisheries outputs and provide important nursery habitat for aquatic organisms. As part of a larger effort to restore these habitats, The Hudson River Park Trust (HRPT) deployed over 300 submerged enhancement structures seeded with approximately 20 million juvenile oysters on the North side of Gansevoort Peninsula in the summer of 2022. To assess the efficacy of videographic monitoring for finfish and other nekton, six underwater cameras were installed around the enhancement site and set on a timer to record video. The video derived from this survey was analyzed using the Video and Image Analytics for Marine Environments (VIAME) system. This pilot work can guide in developing and planning the use of video in cost-effective restoration site monitoring in the Hudson River Riparian Estuary and beyond. Key Words: Hudson River Estuary, eastern oyster, nekton surveying, videographic monitoring, VIAME

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Mercury and Per- and Polyfluoroalkyl Substances (PFAS) in New York's Seneca Lake Sport Fishes

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Seneca Lake serves as a freshwater water source and major fishery for many communities in the Finger Lakes watershed. Very little is known about how diet influences contaminants in Seneca Lake sportfish, especially for per- and polyfluoroalkyl substances (PFAS). The Seneca Lake Trout Derby is an annual fishing event attracting >600 anglers, many of whom consume their catches. Samples were donated by anglers to conduct analyses of diet (stomach content and carbon and nitrogen stable isotope analyses) and contaminants (mercury and PFAS). Four species (Lake Trout, *Salvelinus namaycush*; Landlocked Salmon, *Salmo salar*; Brown Trout, *Salmo trutta*; and Rainbow Trout, *Oncorhynchus mykiss*) were collected in May 2022. We found similar diets and trophic positions among three species but Lake Trout consumed more benthic species such as sculpins and had a significantly higher trophic position. Mercury and perfluorooctanesulfonic acid (PFOS), were also significantly higher in Lake Trout. However, Seneca Lake Trout had elevated concentrations of perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), and perfluorooctanoic acid (PFOA) relative to Lake Ontario, suggesting a unique source in the watershed. This is the first report of PFAS concentrations in several important sportfish species of Seneca Lake.

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Two Year Summary of the Grass Carp Response Program in the Eastern Basin of Lake Erie

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In Lake Erie, a multi-agency effort supports the research and management needs described in the Lake Erie Grass Carp Adaptive Response Strategy. This work was motivated by evidence of reproduction from subsequent increase in captures of diploid Grass Carp (*Ctenopharyngodon idella*) in the western basin, where majority of surveillance efforts have been focused. Program objectives aim to gain a better understanding of the distribution of Grass Carp throughout Lake Erie and reduce the likelihood that new populations will establish. Recent interest in the status of Grass Carp in the eastern basin has jump started two new Grass Carp Response teams. Collaborative efforts between the University of Buffalo (UB) and U.S. Fish and Wildlife Service (USFWS) have focused survey locations where Grass Carp have historically been reported and are exploring other areas where habitat exists. Since 2022, nearly 800 grass carp-specific electrofishing surveys have been conducted in eastern Lake Erie and western Lake Ontario tributaries and harbors (UB n= 686, USFWS n= 105). Fifteen Grass Carp have been captured during these surveys in Dunkirk Harbor, Buffalo Harbor, and Tonawanda Creek; all of which were adults. Ploidy analyses are ongoing with majority triploid and at least one diploid fish captured to date.

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The R/V Marcelle Melosira – A New, Cutting-Edge Hybrid Electric-Diesel Research Vessel on Lake Champlain

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The University of Vermont (UVM) welcomed Research Vessel (R/V) *Marcelle Melosira* to Lake Champlain in July 2023. The 64' catamaran is equipped with a hybrid electric-diesel propulsion system and serves research and education activities on Lake Champlain. The cutting-edge hybrid propulsion system allows the vessel to operate in virtually silent electric mode. The *Marcelle Melosira* is outfitted with a hydraulic A-frame, trawl winches, a rosette sampler, and a scientific winch that transmits real-time data. The design of the *Marcelle Melosira* also features a large, modular laboratory space, a passenger capacity of 32 persons, and full ADA-accessibility. Since July, the *Marcelle Melosira* has taken ~1,400 people on Lake Champlain. Many of these passengers were Vermont K-12 students participating in hands-on environmental science programming with Lake Champlain Sea Grant. Other groups included UVM students in fisheries and limnology classes, and community members participating in bird-watching cruises. Research already underway using the new R/V includes evaluation of hydroacoustic fish profiling without diesel noise, acoustic telemetry studies, and trawling assessments for wild juvenile lake trout. We invite colleagues to visit the vessel and consider potential collaborations using the opportunities available with this new resource.

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Field sampling of neoechinorhynchid fish acanthocephalans (thorny headed worms)

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Acanthocephalans, or thorny headed worms, are parasites which use vertebrates (in this case fish) as their definitive host, negatively affecting host populations. Even though these parasites are important, there is an existing knowledge gap of acanthocephalans and have yet to be analyzed using modern technology, including DNA sequencing. This study will increase our understanding of features of Family Neoechinorhynchidae, a specific group of fish acanthocephalans, by comparing the 8 genera that occur in the United States. This poster covers the results of the fieldwork completed in Spring 2023 to gather genera that will be used for a phylogenetic analysis using DNA sequencing and morphological analyses. Two genera, *Tanaorhamphus* and *Gracilisentis*, were collected from their type locality in Illinois from 28 Gizzard shad, *Dorosoma cepedianum*. While two genera, *Floridosentis* and *Octospiniferoides*, were collected from Florida from 3 White mullet (*Mugil curema*), 20 Eastern mosquitofish (*Gambusia holbrooki*), and 12 Golden silverside (*Labidesthes vanhyningi*), after not being collected in their type locality (Galveston, TX) the summer before. This poster summarizes the results of the survey work and compares it to the original studies that took place 60 and 110 years ago, respectively.

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Estimating Survival Probability of Stocked Juvenile Lake Trout Using Acoustic Telemetry and Kaplan-Meier Survival Curves

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Lake Trout (*Salvelinus namaycush*) are native top predators in the Great Lakes, support an 8-billion-dollar recreational fishery, and are of significant interest for species of restoration and conservation interest. Since their widespread population collapse in the mid-1900s, Lake Trout in the Great Lakes have relied on supplemental stocking. Understanding post-stocking survival rates helps fishery managers estimate the number of fish that should be stocked to create and maintain a self-sustaining population. Our study applied Kaplan-Meier 'time-to-event' analysis to acoustic telemetry detections to estimate post-stocking survival of age-1 Lake Trout in Lake Ontario during a 2017 stocking event. Thirty-eight Lake Trout were acoustic-tagged and released with 77,000 untagged Lake Trout at the Stony Island, NY stocking location. Using raw acoustic detection data, we estimated post-stocking survival rates at 94.7% after one week, 89.5% after one month, and 73.7% after one year. The Kaplan-Meier curve estimated similar results compared to the raw acoustic telemetry data, with a 95% confidence interval providing a measure of uncertainty. In an ever-changing environment with new challenges arising, this technology provides an efficient and cost-effective way of estimating post-stocking survival of Lake Trout in the Great Lakes.

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Investigating a Potential Null Allele Affecting an Assay used to Identify Larval Coregonine Species.

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Coregonus artedi (Cisco) and C. clupeaformis (Lake whitefish) are planktivores in the Great Lakes food webs. Due to overfishing, habitat degradation, competition, and predation from invasive species, Cisco and Lake whitefish populations declined throughout the 1900s. Both species are currently the focus of restoration efforts in Lake Ontario, which require accurate species identification to study factors associated with recruitment. Morphological similarities make it difficult to distinguish between the two species at the larval stage. Amplification of a mitochondrial locus using the polymerase chain reaction (PCR) and a restriction fragment length polymorphism visualized via gel electrophoresis are used for species identification methods. Lake whitefish samples may fail to amplify the locus at higher rates than Cisco. We hypothesize that this is due to mutations in the primer region for Lake whitefish - creating a null allele. Primer-BLAST was used to evaluate sequences of this region for both species. We found Lake whitefish had three nucleotide mismatches at the reverse primer site as compared to two mismatches in Cisco, supporting this hypothesis. Additional predictions associated with amplification rates of two different established PCR protocols and analysis of variation at primer sites via Sanger sequencing will be used to test our hypothesis further.

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The Use of Sagittal Otolith Shape Analysis for Stock Discrimination of Northern Pike

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Northern Pike is a species of significant cultural, economic and ecological importance across its Holarctic distribution as an apex predator within their environment. Sagittal otolith shape has become an influential tool in the identification of fish species and stocks. Despite the well-studied nature of Pike, there have been few studies investigating the use of otolith shape analysis techniques in stock determination of the species, and none have implemented the use elliptic Fourier descriptors (EFDs). 15 Pike were collected from Canadian lakes (Lac Anderson and La Romaine reservoirs, n=30), Swedish lakes (Allgjutten, Jutsajaure, Kallsjön, Remmarsjön and Stensjön, n=69) and the Baltic Sea (n=51) to quantify otolith shape. Otoliths were photographed under magnification using Leica and AmScope cameras. Image analysis programs were used to generate EFDs and obtain otolith measurements of length, height, perimeter and area. Roundness, ellipticity, rectangularity, form factor, aspect ratio and squared perimeter-area ratio were calculated from otolith measurements for shape index analyses. Principal components analysis (PCA) was conducted on EFDs and shape indices to compare the otolith shape of sample subsets. PCAs of both EFDs and shape indices differentiated Swedish and Canadian Pike, while only the PCA of shape indices discriminated between Pike populations from the Swedish lakes.

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Exploring the Historic Hudson River Biological Monitoring Program Sample Collection

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The Hudson River Biological Monitoring Program is a fin fish monitoring program that was established in 1974 to evaluate concerns regarding the negative impacts of power plant cooling systems on Hudson River fish populations. The full program continued until 2017 comprising of a variety of surveys, including but not limited to the Long River Ichthyoplankton Survey, Beach Seine Survey, Atlantic Tomcod Stock Assessment, and Fall Juvenile Survey. These surveys amassed over 500,000 biological samples of 10+ species that have been preserved in 6% formalin since their collection. Samples include whole young-of-year fish, ichthyoplankton, yolk-sac and post-yolk-sac larvae, and eggs. Many striped bass scales and unsorted plankton samples are also included in the archive. This historic sample collection is now the property of Stony Brook University. Here, we discuss the great potential of these samples for addressing scientific and management-related questions, and we welcome inquiries for collaboration.

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Monitoring of Thiamine Deficiency in Lake Ontario Steelhead Trout

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Thiamine deficiency complex (TDC) has been documented in salmonine species from the Great Lakes. In this study, we measured thiamine concentrations in steelhead trout eggs collected at the Salmon River Fish Hatchery between 2015 and 2023. Eggs were also fertilized in 2015, 2016, 2017, 2022, and incubated to determine offspring survival and the lethal concentration that causes 50% of offspring mortality (LC50). A new LC50 was determined at 5.4 nmol/g, lower than the previously estimated concentration. Egg thiamine concentrations significantly varied among years ($p<0.05$). A substantial number of fish (84.5 ± 17.92%) produced eggs below the LC50 across all years. To assess the cause of TDC, we investigated yearly changes in lipid content and fatty acid composition. Lipid content differed among years ($p<0.05$) with the lowest content in 2020 and the highest in 2023. Finally, yearly fatty acid signatures in eggs significantly differed among years ($p<0.05$) and the 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 trout diet, average egg thiamine concentrations were below the LC50 across years and further investigation are required to determine how diet affects thiamine concentration.

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Effect of Riparian Habitat on Fish Diversity in Schenevus Creek, NY

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Riparian zones are transitional areas between aquatic and terrestrial ecosystems and play a crucial role in supporting biodiversity and the conservation of freshwater fishes. Freshwater fishes rely on riparian zones for temperature moderation, improved water quality, and suitable habitat for reproduction. However, human activities and environmental alteration often lead to disturbances in riparian ecosystems, thus impacting fish abundance and diversity. The Schenevus Creek, located in central New York flows through agricultural lands with both vegetated and unvegetated riparian zones. Access to adjacent stretches of the creek with and without vegetated riparian led to the present investigation to determine whether riparian habitat enhances fish diversity. A Halltech HT2000B electrofisher was used to electroshock the 3 vegetated and 3 unvegetated sites. The Shannon-Weiner Diversity Index (SWDI) varied between all sites, with riparian sites having significantly higher diversity ($p=0.002$). The number of species found in both habitat types was compared using a Schoener Overlap Index (SOI) and showed that there is some overlap between the sites, however, this was not significant ($p=0.26$). Results from this study highlight the importance of both vegetated and unvegetated riparian zones for varying species of fish because the sampled species utilize both riparian types.

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Intensive trapping as a management action against red swamp crayfish

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Red swamp crayfish (*Procambarus clarkii*) are invasive on every continent, except Antarctica. Attempted management techniques include trapping, male sterilization, and habitat modification. We initiated an intensive trapping program at a single invaded pond in western New York. We set 1,543 baited traps over 55 nights from July to November 2023. 964 crayfish were trapped, of which 10 were native calico crayfish (*Faxonius immunis*), one was a native White River crayfish (*Procambarus acutus*), and the remaining 953 were red swamp crayfish. Catch per unit effort (CPUE) and total number caught both declined over time, though these trends may be related to the seasonal decline in water temperature or the increase in light penetration. Mean carapace length did not change over time. The sex ratio was evenly distributed at the beginning of the season but changed to male-dominated from late summer to early November, then female-dominated in November. A late-season mark-recapture study was conducted using visible implant elastomer (VIE) tags and suggested that nearly 300 crayfish remain in the pond. These data suggest intensive trapping has an immediate impact on crayfish numbers and will assist us in determining if a proposed control method to enhance the competitiveness of similarly-niched species is effective.

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A Decade of Fish Surveillance: Summarizing a Great Lakes AIS Programs Detections

Lucas Lagoon

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The U.S. Fish and Wildlife's Lower Great Lakes Fish and Wildlife Conservation Office's Aquatic Invasive Species (AIS) program has implemented an early detection monitoring (EDM) program since 2012 across the lower Great Lakes (Erie and Ontario) as informed by a risk-based prioritization framework for AIS in the Great Lakes. The mission of the EDM program is to detect novel AIS early in invasion when management responses are still feasible. In doing so, the program surveys much of the nearshore fish community through a multi-gear monitoring approach. Here we summarize a decade of detections and notable catches from that program's efforts. In total, there have been over 293,000 fish caught in 2,609 surveys and four novel AIS were detected: tench (Tinca Tinca), vermiculated sailfin catfish (Pterygoplichthys disiunctivus), Nile tilapia (Oreochromis niloticus), and an alligator snapping turtle (Macrochelys temminckii). There have also been nine species caught that are on the New York Threatened, Endangered, or New York Heritage Species list. All fish, native and non-native, are recorded which has allowed the program to amass a large dataset that details the near shore fish communities of the sampled areas. This dataset is available for anyone to utilize as they see fit.

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A potential threat to lake whitefish recovery: evaluation of thiamine deficiency

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In the Great Lakes, lake whitefish hold tremendous ecological, commercial, and cultural value. Not only do they link nearshore and offshore food webs, but also have provided substantial benefits to Indigenous communities and the commercial fishery for centuries. Lake whitefish populations have declined markedly in lakes Michigan, Huron, Erie, and Ontario. *Diporeia*, a major prey for juvenile and adult lake whitefish, has declined in all lakes but Superior, coincident with the establishment of dreissenid mussels. Distribution and diet of lake whitefish have shifted in response to the changing abundance of prey, potentially consuming more dreissenid mussels. Dreissenid mussels contain thiaminase, an enzyme which degrades the essential vitamin thiamine. Fish consuming thiaminase-containing prey may produce thiamine deficient eggs, which can cause improper embryonic development, ultimately decreasing natural recruitment. The goal of this study was to evaluate lake whitefish egg thiamine concentrations across the Great Lakes. Lake whitefish eggs were collected in fall 2023 from lakes Superior, Michigan, Huron, Erie, and Ontario. Egg thiamine concentrations were measured using high performance liquid chromatography. These results will contribute to understanding thiamine deficiency in the Great Lakes, lake whitefish response to ecological change, and address research needs to conserve and restore native lake whitefish.

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Habitat's Best Potential: A Necessary Metric

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Management resources are limited and a measure(s) of a habitat unit's "best potential" (that supporting maximum abundance under least disturbed conditions) is necessary for efficient allocation of those resources and effective management actions. Best potential varies among habitats and many are unsuitable for any given species. Using neural network models (simple backpropagation design with one hidden layer), trained with observed fish abundances and anthropogenic-resistant variables (e.g., elevation and landscape slope), we estimated the best potential of all New York Lotic and Lake Ontario aquatic habitat to support each of >100 fish species. Maps of predicted "Best Potential" show the distribution and specific locations of various habitat quality potential for each species, if anthropogenic disturbances are reduced to a minimum. Unsuitable habitats may be eliminated from consideration and managers may focus on best habitats. Overlay of disturbance conditions more clearly highlight habitats that may benefit a particular species (or species group) via restoration or protection. Support for management decisions concerning aquatic habitat protection and restoration within the Great Lakes Region may be improved with knowledge a habitat's ability to support each species and disturbance measures are applied through geographic information systems.

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Soundscapes of the Hudson River Estuary: NERRS Science Collaboration for Bioacoustics Research, Management, and Education

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The National Estuarine Research Reserve System plays an important socio-ecological role for public engagement, science and management focused on key estuarine habitats. The Hudson River National Estuarine Research Reserve (HRNERR) has a diverse stakeholder constituency, along with critical fisheries management goals. The use of passive acoustic monitoring 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. We have been expanding our surveys to cover a broader section of HRNERR component sites and adjacent habitats to understand the seasonal and spatial use patterns of the Reserve by important migratory fishes. The HRNERR research team identified ecosystem services linked to aquatic biodiversity, habitat utilization, and species abundance and phenology were recognized as important for successful estuarine management, especially for priority fish species such as Atlantic Sturgeon, Striped Bass, American Shad, Blueback Herring, and Alewife. The expansion of our program helps establish this growing technology as a strategic approach for science, outreach and engagement in the Hudson River.

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Diet Preference of Major Salmonid Species in Seneca Lake, Using Stomach Content Analysis

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This study was conducted to look further into the diet preference of Salmonids in Seneca Lake using stomach content analysis. Diet preference of Lake Trout and the other observed salmonid species is important because it informs on the health of the ecosystem and shows where the key players in Seneca Lake's food web are located. Lake Trout, Brown Trout, Rainbow Trout, and Landlocked Salmon were collected from two regions of Seneca Lake during the National Seneca Lake Trout Derby in late May 2023. The stomach content analyses involved dissecting the stomach, and removing, visually identifying, and measuring the prey species, if possible. Salmonids from the derby were large, having an average length of 575.54 mm and weight of 453.59 g. Out of the 64 stomachs dissected, only 4 were empty and the mean mass of the prey was 4.00 g (n= 391). The major prey categories were Alewife (63.17%), Slimy Sculpin (2.81%), Spottail Shiner (0.26%), Mysid (1.53%), Quagga Mussel (3.07%), Zebra Mussel (0.26%), Snails (0.26%), Fly Larvae (3.07%), Fly (0.77%), Beetle (0.77%), Plant/Leaf Material (0.51%), and Unknown (23.53%). While salmonid diets were largely dominated by Alewife, they were observed to be variable and contained a multitude of unexpected prey types.

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The Effects of an Experimental Biofilter on Ammonia and Nitrite Removal

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Aquaculture has been a consistently reliable way of developing accessible food sources dating back to prehistory. Since than the Aquaculture industry has only grown technologically, physically, and globally, providing the world with high quality nutrients. With the development of Recirculating Aquaculture Systems (RAS) and tank culture, raising fish has become as efficient as ever. However, problems when carrying fish in such a proximity raise concerns of disease, stress, and mortality brought on by the development of ammonia and nitrite in RAS systems. Biofilters have been implanted as an affordable and manageable way to deal with the byproduct of fish waste. The efficiency of an experimental design of the biofilter was tested to determine the capacity for nitrogenous waste removal.

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Rapid, long range movement and establishment of round goby in the Hudson River, NY confirmed through traditional fish sampling, eDNA, and otolith microchemistry

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Round goby (*Neogobius melanostomus)* has 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 annual beach seine monitoring conducted by the New York State Department of Environmental Conservation. Based on the results from otolith microchemistry and eDNA and beach seine monitoring, round goby exhibited rapid, long range (~140 km) movement from a source population on the Erie Canal and quickly established throughout the upper 2/3 of the tidal Hudson River. Microchemistry results and the size and maturity of individuals captured also suggested a reproductively mature population established in the Hudson River during the year of their initial detection. This study demonstrates the feasibility of eDNA techniques and otolith microchemistry for monitoring a cryptic species in low abundance within a large river system and describing population origins of a rapidly spreading species.

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Age and Growth of Native and Non-Native Catfishes in The Hudson River.

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First reported in the Hudson River estuary in 1979, non-native Channel Catfish (Ictalurus punctatus) has since become a widely abundant species throughout the river. At the same time, the abundance of native White Catfish (Ameiurus catus) has declined. Both species were caught as bycatch during a long-term juvenile Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) gill net survey conducted by the New York State Department of Environmental Conservation (NYSDEC) in the Haverstraw Bay portion of the Hudson River. In addition to biologic data, pectoral spines were also taken from a subset of individuals to be sectioned and aged. Age and length data taken from these catfish between 2017 and 2022 were used to develop age and growth models for both species. Comparing the age and growth between these two species can help provide insight into their life history and whether one species may have a competitive advantage over the other.

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2023 Fall Chinook Salmon Catch Rates in Region 8 Lake Ontario Tributaries

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Chinook salmon (*Oncorhynchus tshawytscha*), first stocked in Lake Ontario in the 1970s, have provided a world class fishery in Lake Ontario and its tributaries. The New York State Department of Environmental Conservation (NYSDEC) conducted tributary creel surveys to assess angling pressure and catch rates in 2005, 2006, 2011, 2015, and 2019. In 2022, it was determined the survey would be conducted annually. The NYSDEC Region 8 survey covers Johnson, Oak Orchard, Sandy, Mill and Maxwell Creeks and the Genesee River. Chinook salmon spawning runs are highly variable but typically begin in mid-September and end around mid-November with peak runs during October. Results from the 2023 season showed above average catch rates for the Genesee River and Irondequoit Creek and below average catch rates for Oak Orchard, Mill and Maxwell Creeks. Poor returns in Mill and Maxwell Creeks were due to low flow regimes in the fall of 2023. Despite low flows, Irondequoit catch rates were the highest on record which was likely caused by an increase in fish straying from nearby stocking points or excellent recruitment of wild fish. NYSDEC will continue monitoring catch rates and make informed management decisions from the data collected during the creel survey.

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Prevalence of thiamine deficiency in lake trout eggs from Cayuga Lake

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Thiamine Deficiency Complex (TDC) affects salmonines from the Great Lakes region with reduced thiamine concentrations in individuals that primarily consume alewife. Deficient females have poor thiamine transfer to their eggs resulting in high post-embryo mortality and therefore lower recruitment. However, changes in forage base that decrease dependence on alewife can reduce the effects of TDC. We determined the prevalence and severity of TDC in Cayuga Lake by monitoring lake trout egg thiamine concentration from 2009 to 2023. Initially, egg thiamine concentrations were above the recommended management objective of 4 nmol/g despite alewife presence. From 2011 to 2014, eggs from most of females were below the threshold, averaging 2.5 nmol/g. Egg thiamine concentrations increased above the recommended threshold in 2015 resulting from the introduction of round goby and their integration in lake trout diet; however, large variations in thiamine concentrations were observed among females. In 2017, egg thiamine concentrations peaked at 12.2 nmol/g, but since then they have decreased substantially reaching 4.7 nmol/g in 2022, with 45% of female below the recommended threshold. These results indicate that TDC is still prevalent in Cayuga Lake despite the introduction of round goby and could be an impediment to lake trout natural recruitment.

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Comparison of lake trout diets among the Finger Lakes using stomach content, fatty acid, and stable isotope analyses

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Lake trout (*Salvelinus namaycush*) are a cold water, top predator, native in New York, including in eight of the eleven Finger Lakes. They are important culturally as a game fish and ecologically as a top predator, but their predator-prey interactions throughout the Finger Lakes are understudied. The Finger Lakes differ greatly in their forage bases, some are inundated with non-native species (e.g., Cayuga Lake) whereas others are more pristine (e.g., Skaneateles Lake), suggesting the ecological role of lake trout varies across these systems. Therefore, we propose to use historical (2014 to 2022) and present (2023 and 2024) data to compare lake trout diets among seven of the Finger Lakes using three complimentary approaches: stomach content, fatty acid signatures, and stable isotopes. We will also assess potential diet shift within each lake throughout time. Preliminary results focusing on stomach content and fatty acid signatures will be discussed. Our results will provide valuable insights into the diets of this native top predator in the Finger Lakes that can be used to inform management for these vital fisheries.

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The renewed Fall Juvenile Survey in the Hudson River

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The Fall Juvenile Survey (FJS), conducted for the New York State Department of Environmental Conservation (NYSDEC) by Normandeau Associates, Inc. and Stony Brook University, was restarted in June 2023. This survey is a continuation of part of the historical Hudson River Biological Monitoring Program (HRBMP), aiming to provide data on juvenile fish in the Hudson River Estuary (HRE) to understand the stock status and recruitment dynamics for targeted species. The sampling followed a stratified random design and occurred every other week on the HRE between New York City and Albany, NY for a total of 10 sampling weeks (June-November). Abundance indices of targeted species were calculated, demonstrating varied abundance trends by species over the survey period. Fish community indices revealed dynamic trends of the fish community over the survey period, highlighting changes in fish diversity and evenness, possibly linked to spawning activities and migration habitats. In situ water quality measurements, including water temperature, dissolved oxygen, specific conductivity, salinity, and turbidity, were also taken each sampling week throughout the HRE. This survey provides continuous monitoring data to aid in the management and conservation of target species in the HRE. The FJS will continue in June 2024.

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Risk summaries as an important aquatic invasive species prevention tool

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U.S. Fish and Wildlife Service

Invasive species cause harm to ecosystems and communities. Prevention of invasions is the most efficient and least costly method of combating invasive species. Yet, as the environment changes, it becomes challenging to understand how the risks of invasive species, and associated effective preventative methods, change too. Ecological Risk Screening Summaries (risk summaries) provide rapid assessments of a species' potential invasiveness. These evaluations are developed through a systematic approach to determine which species are more or less likely to cause damage if they spread outside their native ranges. Risk summaries use climate matching models and previous histories of invasiveness (introductions and impacts) to determine current and future risk. Risk summaries are performed quickly, allowing the evaluation of many new species and updates to previously screened species regularly as the environment changes and new information becomes available. Risk summaries are publicly available to governments, industry, and other interested groups as a readily available source of information to aid in understanding risks of introduced species, making informed decisions about developing watch lists, and informing response and management decisions for invasive species programs.

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Effects of Salinity on Survival and Reproduction of Round Goby

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Round Goby, *Neogobius melanostomus*, have had major impacts on freshwater ecosystems in the United States since their introduction into the Great Lakes in the 1990s. After eastward expansion throughout New York via the Erie Canal, they have recently been detected in a novel estuarine environment, the Hudson River Estuary. To assess the possible future spread of Round Goby into higher salinity waters of the lower Hudson River Estuary and Long Island Sound, we conducted laboratory trials to assess the effects of salinity on long-term survival and reproduction of this species. Experimental tanks containing two male and four female round gobies were maintained for 10 weeks at 9, 15, and 21ppt. Round goby laid egg clutches at all three salinity treatments with varying development rates and hatch success. Post-mortem analysis of adults showed individuals held at 21ppt had a significantly lower hepatosomatic index and no change in biomass throughout the experiment, compared to control tanks and other experimental treatments of 9 and 15ppt. Further experimentation is necessary, however, these preliminary findings suggest that estuarine waters with salinities greater than or equal to 21ppt may not be suitable for Round Goby establishment.

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Locating a Round Goby Invasion Front in Schoharie Creek, NY.

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Round Goby, an invasive bottom-dwelling fish, were first identified in the Mohawk River in 2014 and spread rapidly along the mainstem over the past decade. Benthic ecosystems in tributaries to the Mohawk River, including Schoharie Creek, are threatened by the invasion as Round Goby expansion continues. The objectives of the current study are to locate the invasion front in Schoharie Creek and quantify the rate of upstream expansion. This information will yield a better understanding of how Round Goby invade this tributary and may be used to predict alterations to the Schoharie Creek ecosystem. Six sites were surveyed upstream of the Schoharie Creek confluence with the Mohawk River using backpack electrofishing during fall 2023. Round Goby were captured as far upstream as river kilometer 5.6, indicating over 5 kilometers of previously undocumented expansion since their presence was first identified in 2020. Forthcoming Environmental DNA (eDNA) results, and continued electrofishing and eDNA sampling in spring 2024, will be used to further delineate the location of the invasion front. Once consensus has been reached on the current location of the invasion front, a standardized sampling regime will be implemented to document the rate of upstream expansion over a multi-year period.

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Bass Buddies: Assessing Movement Dynamics of Angled and Released Largemouth Bass in a Northern Natural Lake

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Onondaga Lake in Syracuse, New York has a long history of perturbation by Western culture. Through a combination of superfund status, millions of dollars spent, and countless working groups and studies, the lake has begun to recover, now as a warm-water bass fishery. Its newfound popularity as a bass fishing destination has resulted in fishery pressures extending beyond angler harvest, primarily via relocation. Sport fishing tournaments regularly relocate large Largemouth Bass (*Micropterus nigricans*). This selective relocation may be problematic due to shifts in home ranges of individual bass, potentially affecting catchability and large-scale movement dynamics within the lake. These tournaments do however predictably provide researchers with access to a substantial quantity of bass. In 2022 and 2023, bass were tagged using floy tags at these tournaments, as well as opportunistically for bass captured as part of ongoing fish health and community research. Using a Huggins model for mark and recapture and modeling in RMark, we are able to estimate population size and capture and recapture probabilities. As more bass are recaptured outside of tournament angling, we are also able to compare dispersal from the release site among methods, time, and size.

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Temperature, Tributary Position, Mouth Orientation, and Storage Areas influence Juvenile American Eel Navigation in the Hudson River

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The population of the American Eel has decreased globally by 90% in recent decades. The decline of this species is attributed to a lack of knowledge regarding navigational behavior, inhibiting conservation efforts. We examined the geomorphological characteristics of tributaries, and the hydrodynamic and temperature-related fluctuations within them. Eels were collected daily in a fyke net in Furnace Brook, a tributary system of the Hudson River. Historical data was integrated to analyze navigational preferences and weight over time, spanning from 2008-2022. Results indicated that weight has remained stable over the past fifteen years; with a significant negative relationship between water temperature and weight in 2022 ($p<.05$), and no statistical significance in 2023 ($p>.05$). Eels had a significant preference ($p<.001$) toward western-positioned and northwestern-opening tributaries. Areas of storage within tributaries correlated positively with historical eel recruitment ($p<.05$). Significant correlations were found between water level and in-stream precipitation levels ($p<.05$); however, precipitation did not influence eel arrival. This study helped to advise the Atlantic States Marine Fisheries Commission, which is responsible for creating initiatives to optimize populations within the Hudson River.

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Migratory Patterns of Young-of-Year Shortfin Makos in the Northwest Atlantic Ocean with Implications for a Localized Nursery Area

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The shortfin mako (*Isurus oxyrinchus*) was classified as endangered in 2019 by the IUCN Red List. As a result of their K-selected nature, early life stages, specifically the young of year (YOY) stage, are crucial to species survival. However, knowledge of YOY movement patterns is limited, as the species is highly migratory and evasive. This study aimed to identify a shortfin mako nursery in the Northwest Atlantic Ocean through a novel use of tagging and a preestablished standard for estimating species abundance. A total of 18 shortfin mako sharks were tagged off the coast of Montauk, New York over the summers of 2021-23 using satellite and acoustic tags. Tagged sharks displayed consistent behavior, remaining in the Montauk area from early summer to late fall before moving south for the winter. In addition, catch per unit effort (CPUE) and sightings per unit effort (SPUE) calculations were performed using observational data from 2018-23, revealing three sites with the greatest frequencies of juvenile and YOY shortfin makos. The CPUE and SPUE data along with the movement patterns of the tagged sharks strongly suggest that the area off of Montauk is a nursery habitat for the shortfin mako.

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Investigating Environmental Drivers of Atlantic Striped Bass Spawning Success in the Hudson River Using Long-term Monitoring Survey Data

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The Atlantic striped bass *(Morone saxatilis)* is a anadromous fish, well known for many behavioral factors including large scale spawning migrations. Striped bass are studied and monitored throughout their range, including in the Hudson River estuary system, a known migratory route. For decades, discussions have circled around the success of striped bass spawning in the Hudson. Despite existing knowledge of the influences on striped bass spawning success, the recently observed shifts in weather patterns necessitate further investigation into their potential interactive effects. Our study aims to further explore this ecological dynamic by studying the specific relationships between these environmental parameters and juvenile abundance surveys as a proxy for spawning success within the Hudson River. By using data from the USGS, the NYSDEC Hudson striped bass young-of-the-year survey, and the NYSDEC Western Long Island Juvenile striped bass survey, we will analyze any apparent relationships or current trends. We aim to identify factors such as water temperature and flow rates across different years and locations within the river that may impact spawning outcomes. Ultimately, this study aims to assist with ongoing conservation and management strategies for this iconic species.

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Water Resources Proposed Sportfish Monitoring

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In an effort to increase community involvement and awareness of fish advisories the Water Resource Program WRP of the SRMT Environment Division will analyze target pollutants in locally caught sportfish. Fish will also be accepted from community members who agree to be a part of the sampling regime that determines average mean concentrations of pollutants. This method of sample collection will be a valuable tool in terms of costs efficacy and angler representativeness (40 CFR 35.162). It will also increase community involvement, awareness, and investment in the results that the Tribe produces.

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An Individual-Based Model to Evaluate Influence of Migration Behavior on Pelagic and Benthic Resource Contributions to Growth of the Omnivorous Mysis

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Mysis is an omnivorous macroinvertebrate that couples benthic and pelagic habitats through diel vertical migration (DVM). They can exert strong predation pressure on plankton and are a dominant prey for benthic and pelagic fishes. Consequently, their energetic pathways have major implications for energy and nutrient flux within and across habitats, food web function, and predator-prey dynamics. However, most *Mysis* research focuses on pelagic habitats. For example, food web models that only incorporate night pelagic *Mysis* estimates often underestimate *Mysis* biomass and production, up to 50% of *Mysis* carbon can originate from benthic sources, and *Mysis* exhibit partial DVM where a subset of the population remains on bottom at night. We developed a simple individual-based model (IBM), where DVM was governed solely by daily light cycles, and used it to assess the relative lifetime contributions of pelagic- and benthic-derived resources to *Mysis* growth as a function of varying migration behaviors under seasonally varying, habitat-dependent resource profitability. Modeled growth and pelagic resource contribution to growth were positively related to migration participation, as expected. Our IBM provides a foundation to explore how additional factors (e.g., size-based, habitat-dependent predation) may contribute to the variety of observed DVM behaviors and their influence on energetic pathways.

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Change in Mercury Guidelines for Fish Consumption

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NYS DOH is in the process of updating fish consumption advisories after a change in statewide mercury guidelines. This update adds a level of complexity that fundamentally changes how these advisories will need to be shared with the public. To understand how to best express these new advisories, Outreach and Education has been testing various methods of sharing this information with different audiences. Now that a method has been adopted, NYS DOH begins the task of altering all our previous outreach material to reflect this new framework statewide. The poster will include:

Our new statewide advice for fish consumption.

A brief description of the process to apply new mercury guidelines.

Share results from our statewide NYS licensed angler survey on fish consumption habits.

Showing the different versions of brochures and an explanation of our process for testing them.

Description of the complications that came with implementing this new guideline.

A infographic of our county maps, showing the layers of complexity we had to consider.

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Recovery efforts for species of freshwater mussels within the Superfund Site in the lower Grasse River in Massena, NY.

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The Saint Regis Mohawk Tribe's (SRMT) Environment Division (Akwesasne, NY) was granted Great Lakes Restoration Initiative (GLRI) funding for efforts to propagate freshwater mussels that are found locally within the Grasse River Superfund Site. To date, at this site, there has been 48 acres dredged with 220,000 cubic yards of PCB contaminated sediment removed and a total of 259 acres capped which caused detrimental effects to the thriving mussel community that inhabit this water body. It has been estimated that without intervention, nearly 1.7 million mussels would have been affected as a result of these activities. Through multiple years (2017-2021) of recovery and relocation by the New York State Department of Environmental Conservation (NYSDEC) and the inputs from our SRMT freshwater mussel propagation project, the efforts will aid in the recovery efforts back to a stable community. This poster will briefly outline SRMT's ongoing work with *Leptodea fragilis* (Fragile papershell), *Potamilus alatus* (Pink heelsplitter) and *Lampsilis radiata* (Eastern lampmussel); three of the top four most populated and impacted species in the lower Grasse River. SRMT is the first organization in New York State to successfully propagate and reintroduce freshwater mussels back into the wild.

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The Prevalence of Invasive Species in Lake Erie Sportfish Diets

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In September 2023, stomach samples for smallmouth bass (*Micropterus dolomieu*) and yellow perch (*Perca flavescens*) were collected by New York's Lake Erie Fisheries Research Unit in the eastern basin of Lake Erie. Stomach contents were identified to the lowest taxonomic level and used to quantify the percent occurrence and percent by volume of each prey species. The results of the smallmouth bass stomach analysis were compared to a previous bass study that assessed the occurrence of diet items pre- (1985–1987, 1992) and post- (1999–2002, 2006–2007) round goby (*Neogobius melanostomus*) establishment in eastern Lake Erie (Crane and Einhouse, 2016). No previous yellow perch diet assessment was conducted in the eastern basin of Lake Erie. The intention of this study is to assess the current composition of smallmouth bass diets, consider if and how it has changed; and begin to document diet contents of yellow perch. The results indicate that diets of both smallmouth bass and yellow perch are mostly composed of invasive species. The historical smallmouth bass diet assessment illustrated a shift to a round goby dominated diet following their establishment and the 2023 assessment found goby continues to be the most common item in smallmouth diets.

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Response of Banded Killifish (*Fundulus diaphanus*) to Increasing Acidity at Given Saline Concentrations

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The global decrease in ocean pH creates a problem for all kinds of aquatic life, but the danger of increasing acidity is poorly studied in areas of fluctuating salinities such as estuaries. Additionally, estuarian fish are used less frequently in tolerance trials, leading to less information on their specific thresholds to physical and chemical concentrations within the water. This can lead to gaps in the knowledge on how to deal with fishes that are subject to being trapped within areas of increasing salinity. To determine whether Banded Killifish will exhibit greater mortality due to increasing acidity at higher salinities, treatment trials were conducted at SUNY Cobleskill using citric acid to lower the waters acidity in daily increments of .5 within tanks of different salinity concentrations. Results showed higher mortality observed across each pH increment the higher the salinity became. 80% of deaths within the lower salinity treatments were observed at 3.5, while 100% of deaths within the higher treatments were recorded prior to 3.5. While a statistical analysis was not conducted on these results, there is a clear correlation between mortality rate and acidity within higher salinity, indicating Banded Killifish lose their ability to tolerate low pH in hypersaline conditions.

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